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Knitting Arts Exhibition Number

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VOLUME 27 APRIL 18, 1938 NUMBER 8

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OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

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Knitting Arts Exhibition Number

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Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable way research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

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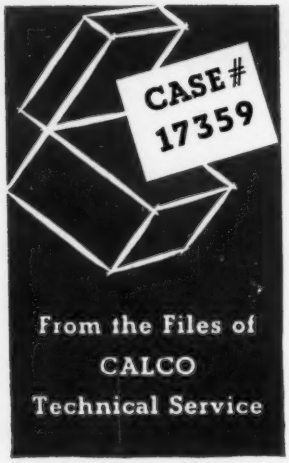

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This is but one of many instances where Calco's Technical Service has been of practical help in time of need. This service is available to any user of dyestuffs without cost or obligation. Perhaps it can help you make a profitable operation out of some difficult assignment—or to bring greater economies to your production of high-quality products. Simply write or wire our main office or nearest branch office, and a member of our technical staff will be sent promptly, and without obligation, to talk over your problems with you.

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Knitting Arts Exhibition Number

AMERICAN
DYESTUFF REPORTER

VOLUME 27 APRIL 18, 1938 NUMBER 8

Thirty-Fourth Annual

Knitting Arts Exhibition

ONE week from today, on April 25th, the thirty-fourth annual Knitting Arts Exhibition will open at the Commercial Museum in Philadelphia under the joint auspices of the National Association of Hosiery Manufacturers and the Underwear Institute. The exhibition will continue through the week. The latest developments in machinery, products and methods will be brought together under one roof for inspection by the visitors at their leisure. It affords an excellent opportunity for buyers and sellers to meet together under ideal conditions.

The leading manufacturers of knitting, dyeing and drying machinery, mill supplies and allied products, will exhibit their latest designs, processes and equipment. These manufacturers consider it to be one of the most economical and effective means of presenting their products to the entire knitting trade in one place at one time. They show that they know this to be true by the fact that they exhibit year after year . . . figures indicate that ninety-three per cent of the exhibitors repeat year after year. According to advance information the exhibit this year will surpass that of last year in point of total space used and number of exhibitors.

Those who are engaged in the wet processing branch of the knit goods and hosiery industry can see many exhibits which will prove of special interest to them. We suggest that you see all of the exhibits if possible but if you are in a hurry and wish to save time we believe that the following descriptions will prove of value to you in order that you may see the latest developments in the particular branch of the industry in which you have the greatest interest.

Exhibits of Special Interest to the Wet Processing Branch of the Knit Goods and Hosiery Industry

THE AMERICAN ROLLING MILL COMPANY
Spaces 22 and 23

Stainless steel drying, bleaching and wet-finishing equipment will be exhibited.

In attendance:—J. H. Faunce, R. C. Cunningham, W. K. Jackson, F. S. Campbell and Austin Wortley.

BARKON-FRINK TUBE LIGHTING CORP.
Space 70

On exhibition will be the standard models of this company's Carbon Dioxide lamps together with their new bench model. They will be equipped to make a complete demonstration of the value of this type of lighting for accurate color control.

In attendance:—F. W. McGinnis, Dr. T. J. Killian and Mr. Scribner.

H. W. BUTTERWORTH & SONS COMPANY
Spaces 64, 65 and 66

A large elevation of a Tube-Tex Range will be shown. It is stated that in 1937 75,000,000 pounds of fabric were processed on Tube-Tex individual machines and ranges. In addition the Stokes-Butterworth Staple Fiber Cutter will be shown in actual operation. This machine is said to cut wool, silk, flax, rayon, etc. into lengths from ¼" to 6", 6 strands at a time, up to 500 pounds per hour, so that these materials can be handled on cotton and wool spinning machinery. The machine is driven by a 1/3 H.P. motor which is fully enclosed.

In attendance:—Harry W. Butterworth, Jr., W. E. H. Bell, Albert Molt, and Mortimer Cohn.

W. F. FANCOURT & CO.
Space 249

This exhibit will feature Aquapel—a one bath product for splash-proofing and finishing hosiery, that is said to impart marvelous boarding properties and to render the hosiery more snag, run and crease proof; further than good lengths are obtained without distortion of the stitches. Fanco Dulzit—a delustrant which when used in conjunction with Aquapel is said to produce the combined result of dulling and waterproofing in the one operation will also be shown. Several other products of interest to the knitting trade will be on display as well as hosiery and fabric finished with Fanco products.

In attendance:—W. F. Fancourt, Jr., W. F. Fancourt, 3rd, Charles T. Harvey and Howard A. Virkler.

FLETCHER WORKS, INC.
Spaces 171, 172, 173 and 174

Fletcher "Whirlwind" and "Standard" Extractors will be shown here. The "Standard" Extractor is a new low-priced machine built on modern, stream-lined principles and includes automatic timing device and signal light as standard equipment. Also shown will be the Apex Double Deck Twister, Duplex Doubler Twister, Simplex Double Deck Winder.

In attendance:—R. J. Bartholomew, C. W. Moore, Fletcher Schaum, W. H. Rometsch, Jr., J. M. Crozier and F. W. Warrington.

THE J. B. FORD SALES COMPANY
Space 352

A complete line of the Wyandotte Alkalies and Sodas used in the processing of all fabrics will be shown. Information will be available regarding the use of these products in dyeing, bleaching, finishing and scouring as well as concerning the saponification of acetates and the sterilizing and deodorizing process for prevention of mildew.

In attendance:—F. S. Klebart, Wyandotte, H. E. Moyer, Philadelphia, John W. Turner, Philadelphia and James F. Flaherty, Boston.

GENERAL ELECTRIC VAPOR LAMP COMPANY
Spaces 182, 183 and 184

The latest development in gaseous discharge lighting will be displayed. Cooper Hewitt lighting for all departments of knitting and weaving mills will be demonstrated, including Cooper Hewitt Industrial Units, Cooper Hewitt-Mazda Combination units and Type H Mercury Vapor units.

In attendance:—Chas. F. Strebig, D. R. Grandy, W. R. Flounders, R. B. Chipman, F. Moos and L. F. Gerisch.

GRAND RAPIDS TEXTILE MACHINERY COMPANY, INC.
Spaces 159, 160, 185 and 186

The following machinery will be on display and in full operation: Roto Press machine, Garment Finisher, Universal Finishing Machine, General Upright Finisher, Sample Drier and Extractor Loader. In addition to the equipment exhibited this company builds scouring, dyeing, drying, finishing, cutting, pressing equipment for handling all tubular knit textiles of wool, cotton or rayon for underwear or outerwear.

In attendance:—W. H. Shields, W. F. Moon and M. F. Shields.

THE INTERNATIONAL NICKEL COMPANY, INC.
Spaces 16 and 17

Mill and fabricated forms of Monel dyehouse equipment will be shown.

In attendance:—E. A. Turner and C. J. Bianowicz.

W. H. & F. JORDAN, JR., MFG. COMPANY
Spaces 24 and 25

The following products will be on display: textile oils, cotton softeners, sulfonated oils, penetrating agents, scouring oils, finishes and specialties.

In attendance:—Canfield Jordan, H. B. Dohner, R. A. Bruce, John T. McGrogan, G. C. Harkins and F. T. Quinlan.

LAUREL SOAP MFG. COMPANY, INC.
Space 211

Fabrics treated with various Laurel Finishes will be exhibited.

In attendance:—C. E. Bertolet, Wm. H. Bertolet, Jr., C. C. Hagelgans, A. Henry Gaede, E. W. Seasongood.

LEATEX CHEMICAL COMPANY
Space 43

Chemical specialties for wet processing of textile fibers and fabrics.

In attendance:—J. M. McChesney, J. F. Rieder, R. R. Willgoos, M. M. Guertin, H. Higginbotham, C. L. Hammell, Louis Soistmann.

MACBETH DAYLIGHTING COMPANY, INC.
Space 168

Demonstrated will be their latest development in color matching equipment—the BKX83 box lamp containing 3 1,000 watt bulbs and special Corning Daylight filters, which are claimed to be the only ones approved by the National Bureau of Standards and the A.S.T.M. as reproducing any type of natural daylight and Horizon-Sunlight. Also exhibited will be the regular color matching lamp, the AKP82 and a new grading and examining lamp, the BSXV8.

In attendance:—Norman Macbeth, Benjamian J. King, Peter H. Lawson, William C. Barrett and F. F. Phillips.

ONYX OIL & CHEMICAL COMPANY
Space 217

Featured at this booth will be a complete line of degumming, dyeing, dulling, spotproofing and finishing compounds, together with samples of silk and rayon hosiery and underwear processed with Onyx products. Especial attention will be centered upon several of the newer hosiery and underwear products, namely: Mapro Degum, for one-bath hosiery boil-off and dyeing; Fiba-Perm Hosiery Finish for increased strength and elasticity; Silk-O-Ray to produce a "silky" feel on rayon underwear; Onyxsan, a softener for synthetic fabrics.

In attendance:—A. C. Mackey, C. D. Ehrengart, L. P. Brick, J. Tresize, E. W. Klumph and A. R. Jenny.

THE PERMUTIT COMPANY
Space 355

Water conditioning equipment.

In attendance:—M. F. Corin, D. J. Hess, N. Sharp, W. L. Lowrie and E. O. House.

THE PHILADELPHIA DRYING MACHINERY COMPANY, INC.
Space 209

This display will consist of illustrations of latest improved drying machinery for raw stock, skein and warp yarns, packages, hosiery, underwear, toweling and piece goods. Also the latest developments in tenter dryers, carbonizing equipment, twist setting machines and vacuum extractors.

In attendance:—W. W. Sibson, H. O. Kaufmann and B. M. Jones.

PROCTOR & SCHWARTZ, INC.
Spaces 268, 269, 277, 278, 291 and 292

A working demonstration of boarding machines, both for women's stockings and men's half hose, will be given. Featured will be an automatic device for imparting a special finish to long, short and medium length hosiery, after it leaves the hands of the boarders. Also shown will be a new hard finish to the hosiery boards and they will demonstrate a modern method of obtaining equalized drying of all weights of stockings.

In attendance:—Major C. T. Griffith, Chas. S. Tiers, Harry B. Lex, Wm. J. Merrigan.

QUAKER CHEMICAL PRODUCTS CORP.
Space 418

Products for use in various textile processes will be on display.

In attendance:—E. Niessen, Geo. F. Ecker, Dr. Adolph Krueger, Harry N. Kopple, George F. Lobb and John W. Brown.

REPUBLIC STEEL CORPORATION
Spaces 46, 47, 48 and 49

On exhibit will be Enduro stainless steel articles such as experimental bleaching kier, expander arrangement, tenter frame clips, roller bearings, miniature jig tubs, miniature dry can and liner, dye jig, humidifying units, utensils, pails, dippers and other fabricated articles.

In attendance:—C. C. Snyder, G. W. Hinkle, L. L. Caskey, E. S. Dehn, E. C. Anderson, J. K. Bole, W. H. Oliver, H. N. Evans, A. W. Minuse, C. B. Pharo, Jr., and F. D. Jones.

ROCHESTER ENGINEERING & CENTRIFUGAL CORPORATION
Spaces 250 and 251

The following equipment will be on display: 30x20" Super Dyeing Machine; 30x36" Super Dyeing Machine; 17" Monex Extractor; 40" O.T. Extractor.

In attendance:—P. B. Compton, R. C. Caine, C. J. Henderson and C. F. Fischer.

SCHOLLER BROTHERS, INC.
Spaces 252 and 253

Shown here will be samples of soaps, softeners, oils, finishing compounds, etc., as supplied to the textile industry and featuring the combination Durabond Finishes for hosiery and knit goods.

In attendance:—F. C. Scholler, E. S. Atkinson, J. F. Noble, L. M. Boyd, W. A. Daniel, Wm. Jackson, Jr., Harold Miller.

SMITH, DRUM & COMPANY
Spaces 26, 27, 28, 29, 30, 31, 32, 33, 34 and 35

Hosiery, skein, piece goods and package dyeing machines, together with auxiliary equipment will be shown here.

In attendance:—Harry S. Drum, W. C. Dodson, J. E. MacDougall, J. M. Ballentine and P. M. Parrott.

VENANGO ENGINEERING COMPANY, INC.
Spaces 254 and 255

Stainless steel rotary type hosiery dyeing machines, both commercial and new floating rotary type.

In attendance:—H. G. Doak, M. Speizman, A. Robertson, Messrs. Dunbar and Jantzen.

—♦ ♦—

Hosiery Machinery

Yesterday and Today

C. W. MEYERS*

THE FIRST HOSIERY FRAME

AS the opening date of the Annual Knitting Arts Exhibition draws closer, we wonder what would be the reaction of good Queen Bess could she see the modern improved knitting machinery, the present dyeing and boarding equipment, and the various finishing specialties now in general use in the hosiery business. When, in 1589, William Lee first appealed to the Queen for patent rights to his stocking frame, she, even at that early date, being obsessed by the bug-a-boo of technological unemployment, refused to grant him a patent. In a letter to Lord Hunsdon she wrote "My Lord, I have too much love for my poor people, who obtain their bread by

*Assistant Supt. of Dyeing, Massachusetts Knitting Mills.

the employment of knitting, to give my support to forward an invention that will tend toward their ruin. . . . Had Mr. Lee made a machine that would knit silk stockings, I should, I think, have been somewhat justified in granting him a patent; for that monopoly would have affected only a small number of my subjects."

Lee's first frame was a twelve gauge machine for knitting worsted yarns. After nine years of hard work he managed to adapt the frame to one of 30 gauge for knitting silk yarns. However, the imperious queen still refused to grant him the exclusive right of manufacture; and after her death, when King James also refused him a patent, Lee moved to France, taking with him several completed frames, where he was received with open arms by Henry IV.

ORIGIN OF KNITTING UNKNOWN

The origin of the art of knitting is unknown. In earlier days there seems to have been no distinction between knitting and weaving; and the first historical mention of the word "knit" was in the latter part of the 15th century. Inferences drawn from historical references, however, indicate that the art was practiced at a much earlier period. Fishing nets, which have been in use since the time of the Pharaohs, probably were the earliest examples of knitting. They were, as they are today, made from one line, meshes formed and corners knotted so as to be not easily broken, or, if broken, so that the cord could not run further; a non-elastic web.

One classical reference of elastic web that could only be produced by knitting is that where Homer describes Penelope as weaving a fabric by day " . . . her own sad story crowned The Trojans wars she weaved, herself the prize," which she unravels at night while the suitors sleep. If the fabric were loom woven with warp and filling, more time would be required to take it to pieces than to weave it. If knitted, however, the product of a days labor could be unraveled in a short time; and each following morning the work would be found ready to be continued. There are numerous other historical references which lead to the conclusion that knitting is one of the older arts.

LEG COVERINGS

Leggings and wrappings were the first dress for the lower limbs. The first stockings were made in the 7th century and were crude affairs cut from cloth or leather with ungainly seams. Up to the twelfth century this primitive form of hose was worn only by nobles. In the fourteenth century (the time of the first crusades) the city fathers who had become merchants began to ape the customs of the nobles. Then hosiery became more common, even in the bright shades of green and red. The growth of the European silk industry made this previously expensive fiber more popular, and in the sixteenth century the first silk stockings were imported into England from Spain.

DEVELOPMENT OF THE INDUSTRY

Until the invention of the knit frame there was very little historical mention of hand knit hose and the merchandization of knitting; and two hundred and fifty years more passed during which Lee's frame was manually operated. The invention of an automatic narrowing frame, (Barton-1838) a moveable needle bar, (Paget-1861) and vertical alignment of needles (Cotton-1864) started the full fashioned industry toward its present growth. Until the time of Cotton's patent, knitting was done on a single section. Cotton really established the modern system. Two and four section machines then became common, and gradual growth brought twelve, sixteen and eighteen sections. Modern installation includes machines with as many as twenty-six sections.

INCREASE IN EMPLOYMENT IN EUROPE

It is interesting to note the increase in employment when accurate figures first became available. In 1812 out of 42,771 hand frames in Europe 30,000 were engaged in knitting hosiery, giving employment to about 60,000 people. In 1844 there were 100,000 people employed on 48,595 frames in the British Isles. In 1864 in only the Nottingham district of England there were 61,000 people employed at knitting. All of this development came from Lee's mechanization of knitting which Queen Elizabeth feared would ruin her poor subjects; and all of this was prior to Cotton's patent.

DEVELOPMENT IN THE UNITED STATES

In the United States most of the development has been since Cotton's invention. In 1775 there were 150 stocking frames at Germantown and near the Brandywine. This had increased to only 200 by 1815. The great growth here has been since the Textile Machine Works, Reading, Pa., was established in 1898. Statistics show that since that time 18,000 machines have been installed in the United States with an average of 20 sections per machine. In 1937 there were 15,800 machines in place. These machines were operated by 358 mills which gave employment to about 100,000 people.

HOSIERY DYEING

The knitting industry by its progress has made necessary the development of special equipment in the dyeing and finishing industries. The full fashioned hosiery industry in particular, which, of late years, has confined itself mainly to the manufacture of silk hosiery, has had need of equipment to handle this expensive and tender fiber without subjecting it to harsh treatment.

For many years hosiery was knit only from dyed yarns, but today there is very little hose knit ingrain, i.e., from dyed yarn. The first mention we have of piece dyeing or dip dyed hosiery is by Harrison in 1577, who states that "the peasant wives used the bark of alder trees for dyeing the hose they had knitted." Dip dyeing was not common until after the discovery of coal-tar dyes. The discovery of coal-tar dyes (Perkins-1856) was made about the same time that the Cotton patent frame was developed. This brought about changes in the technique of dyeing and made possible the break from yarn and stock dyeing to piece dyeing. This was a very fortunate discovery for the later developments in silk hosiery manufacture. It made

possible the use of two fibers, one animal and one vegetable in the same fabric without there being too much difficulty in obtaining good union matching. The ease the hosiery dyer has today in dyeing blacks on lisle topped silk hosiery with diazo and Zambesi blacks, compared with the trouble of logwood dyeing, shows how developments from Perkins' discovery have facilitated the handling of union goods.

DEVELOPMENT OF HOSIERY DYEING MACHINES

The machinery for hosiery dyeing has also undergone many changes. Hosiery originally was knit from dyed yarns, but development of piece dyeing equipment was necessary to keep up with increased demand. The first dip was done in open vats with constant poling of the goods. For some kinds of hose the toes were sewed together, and the stockings then hung on poles and moved in the dye liquor.

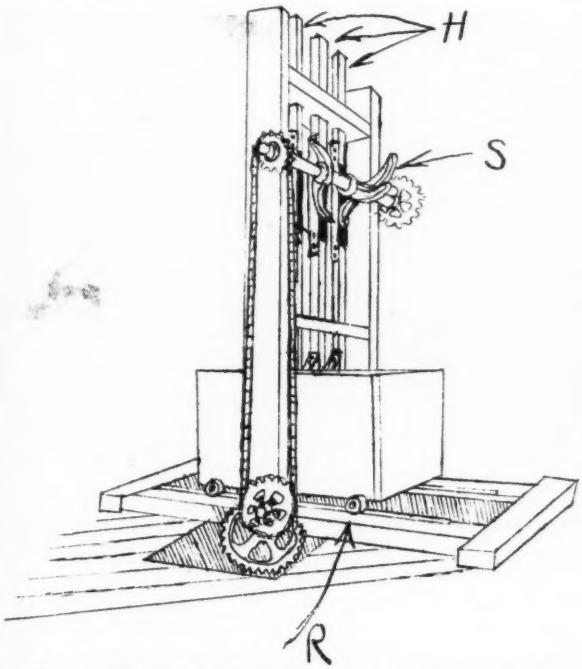
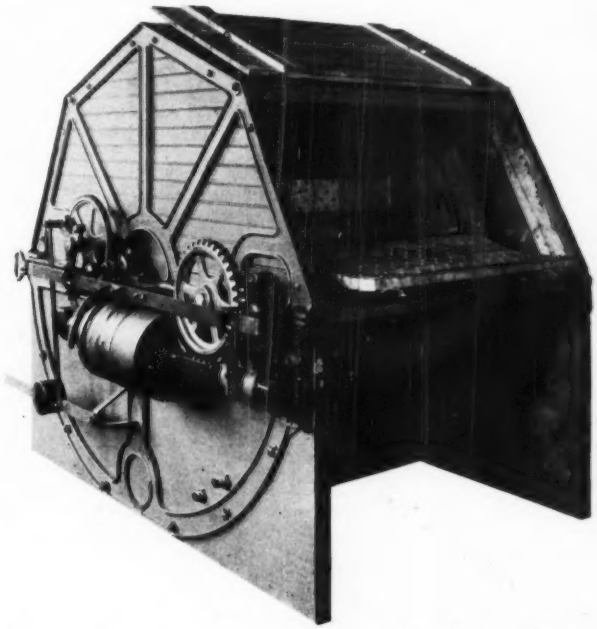


Fig. 1—Tom-Tom—Early hosiery scouring machine.

With constant increase in production these methods became obsolete and piece dyeing machinery was gradually introduced. One of the early machines was the dolly washer or tom-tom shown in Figure 1. The hosiery was loaded into the large rectangular dye tub which ran back and forth along rails (R). While this reciprocating action was being imparted to the tub the hammers or tom toms (H) were lifted by Cams (S) and fell back on the goods by their own weight. The tub traveled slower than the beaters. The Hussong stock dyer was another type used for hosiery dyeing. The hose was packed in a large cage which was immersed in a rectangular tub filled with the dye liquor. The liquor was circulated by means of a pump. Neither of these machines were suitable for dyeing high grade silk hosiery. They were used more for loosely knit cotton or woolen hose which was easily penetrated.

The paddle machine was most commonly used for dyeing silk hose. This is a large tub with a half round bottom and high sides with a large paddle wheel for circulating goods and dye liquor. The goods were loaded into the tub in net bags and the liquor surface was raised so that the lower half of one of the fins of the paddle was immersed. The movement of the fins through the water agitated the dye liquor and pulled the bags around. This type of machine is still in use, some dyers prefering it to the newer rotary drum. The paddle machine gives good penetration but the tangling action is greater, and, if the goods are run a long time with too many additions there is chance of uneven dyeing. It is the general opinion that the beating action of the paddle is detrimental to fine fabrics. With the adoption of highly twisted yarns, cotton and silk splicing and reinforcing, and more tightly knit hose, the need for a machine with positive circulation of the goods with a minimum of tangling became imperative.



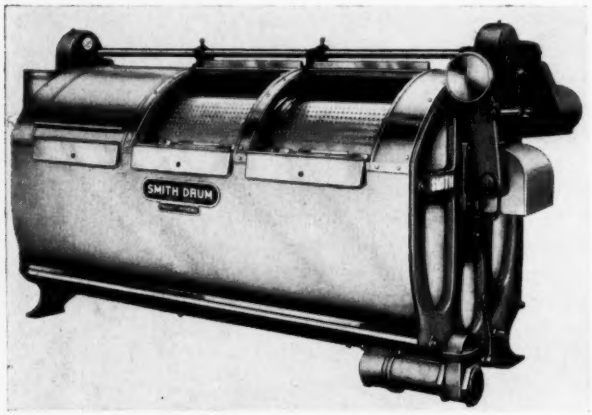
Courtesy of Smith Drum & Company.

Fig. 2—One of the first Smith Drum Hosiery Dyeing Machines. Note Wooden drum, hinged construction of pocket and belt drive.

ROTARY DRUM DYEING MACHINES

The first machine insuring positive circulation was the rotary drum dye tub. The first hosiery rotaries were adapted from rotary yarn dyers. These were wooden drums without partitions. They were not very satisfactory in that form, as the goods settled in the bottom of the drum and were not agitated sufficiently to secure even dyeing. Good results were obtained, however, with the inside of the drum divided into pockets. Wooden rotaries were not long in use, the stainless metal machines quickly displacing them. Various internal drum designs were

tried. One construction was without horizontal partitions, but with internal fins to impart a tumbling action to the goods. From this the designs followed to a Y pocket machine and then to the quarter section. This last design is used in almost all the rotary dyeing machines today. Each year has brought many minor improvements in design.



Courtesy of Smith Drum & Company.

Fig. 3—New Smith Drum Hosiery Dyeing Machine. Note Monel construction, sliding pockets and direct drive. Machine capacity 300 pounds of hosiery. Compare with Fig. 2.

Were the industry still dependent on the old tub method of dyeing, over 50,000 men would be needed to dye the 1937 hosiery production of the United States.

EARLY BOARDING METHODS

The development of boarding machinery has kept pace with the improvements in knitting and dyeing. Just as it is a long step from the knitting frame to the twenty-six section machine, so it is a long step from steam jet and dry box pressing to the modern motor driven boarding machine.

Boarding is, perhaps, a better descriptive term for this operation then pressing. The stocking is not pressed, but while it is still damp, it is pulled on a metal or wooden form to be shaped and then set in that shape by drying.

Temperature control is most important in full fashioned hosiery boarding. Most full fashioned hosiery is made of silk and too high a temperature may adversely affect the wearing quality. Other faults arise from high or uncontrolled temperature such as (1) the stocking drying out, causing bad pressing, (2) permanent creases in heavy thread stockings from too quick drying, (3) harsh handle, (4) dyestuff color altered, (5) white hose may be yellowed. Modern devices insure controlled heat for drying any kind of hose.

Innumerable methods of drying have been tried. One of the oldest forms of machine press is the bed press. (Figure 4). This was made up of either two or three beds, the lower bed fixed and the upper moveable. In the pressing operation the moveable bed was raised, and the dampened hose on forms were placed between the beds. The beds were then pressed together and steam was run through

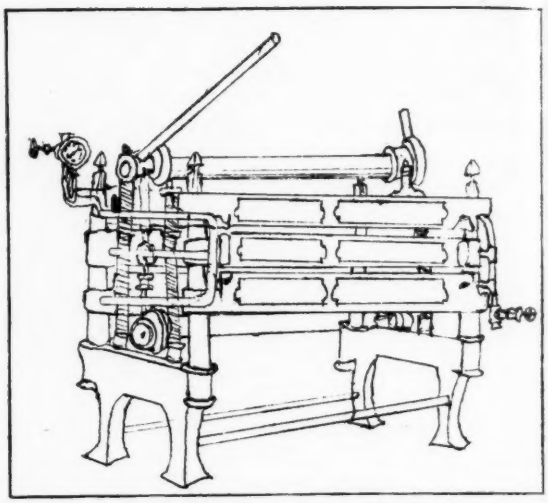
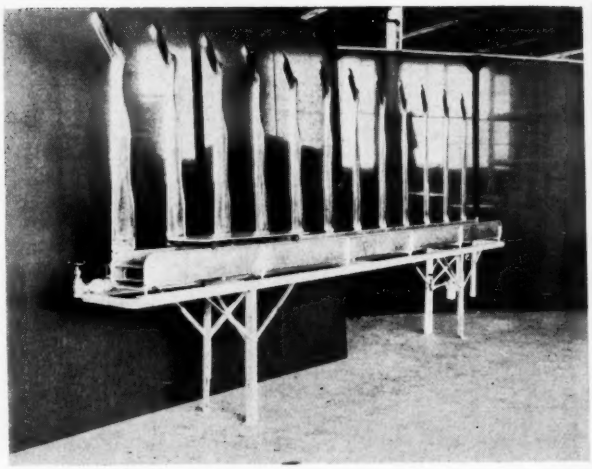


Fig. 4—Early type Pressing Machine.



Courtesy of Paramount Textile Machinery Company.

Fig. 5—Set of Steam Forms for Full Fashioned Silk Hosiery.

them. The forms were then removed, placed in a dry box, and after drying, the hose was stripped. This type of pressing machine was used particularly on cotton hose to impart a glossy finish. Production per man was low.

For silk hose the older methods of boarding were, either (1) by pulling the dampened hose or wooden forms, shaping and then drying; or (2) by boarding dry, steaming in a jet or in a garment press and then drying. While the quality of the work done by these methods was good, quantity production was low.

The series of "bellied", steam heated forms (Figure 5), although bettering quality, did not help to speed up production. The rollered tray was for finished work, the wet goods rack being used for a track, a concession toward quantity production. On this kind of boarding equipment the boarder walked back and forth along the set, stripping and boarding three stockings at a time as fast as they dried. This type of form could also be heated with hot water.

(Continued on page 227)

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

APRIL 18, 1938

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CALENDAR OF COMING EVENTS

Meeting, New York Section, Swiss Chalet, Rochelle Park, N. J., April 22, 1938.

Meeting, Northern New England Section, Andover Country Club, Andover, Mass., May 6, 1938. Speakers: K. H. Barnard, "Permanent Finishes on Textiles"; Hugh Christison, "Olive Oil Substitutes for Worsted Lubrication"; Edward S. Chapin, "Fixing of Dyes Before and After Dyeing"; Alex. Morrison, Subject to be announced later.

Meeting, Philadelphia Section, Penn A. C., Philadelphia, Pa., April 22, 1938.

Meeting, Southeastern Section, Hotel Dempsey, Macon, Ga., April 23, 1938.

Meeting, Council, National Bureau of Standards, Washington, D. C., 9:30 A. M., April 30, 1938. Research Committee will meet in the afternoon of the same day. Note: These meetings were originally scheduled for April 29th.

Spring Meeting, Piedmont Section, Greensboro, N. C., May 7, 1938.

Meeting, Mid-West Section, Hotel Schroeder, Milwaukee, Wis., May 7, 1938.

Annual Meeting and Convention, Atlanta, Ga., December 2 and 3, 1938.

Causes of Some Common
Hosiery Defects and their Correction*

DR. H. H. MOSHER†

A COLORED maid had attended divine worship for the first time and was asked by her mistress whether she enjoyed the services and understood the text of the sermon. "Oh sure," she replied, "the text was simple enough but the preacher's explanation of it was powerful puzzlin'."

I hope that I do not have a similar experience today, and trust that I will not make the simplest subject seem complex, an accusation frequently made against speakers on scientific subjects.

INTRODUCTION

Hosiery dyers, particularly those of the old school, occasionally deplore the more modern trends in hosiery processing. They contend, and not without some element of truth, that the dyeing and finishing operations have and are becoming increasingly complex, and that the increased complexity is generally attended by a host of defects in the finished product never experienced in the halycon days of the industry. They aver that chemists in their efforts to systematize and render scientific an empirical process have opened a veritable Pandora's box and liberated plagues of those progenitors which cause unlevel dyeings, two-tone effects, oil spots and poor wearability with which to torment the poor overworked hosiery dyers.

It is these hosiery pestilences which will receive our attention tonight.

UNLEVEL DYEINGS AND TWO-TONES

There are three main factors which contribute to the development of those dyeing irregularities known as unlevelness or as two-tone.

In the consideration of this factor we must differentiate between unlevel and streaky dyeings induced by the overcrowding of merchandise into boil-off bags and kindred unsound practices known to every experienced operator.

I am grouping as unlevelness the so-called two-tone effects and the tendency of certain occasional hose within a lot to assume a level though different color shade than the other components of the batch even where identical processing conditions prevail. The silk comprising the unlevel dyed lot apparently possesses a variable coefficient for color adsorption.

The color differences need not apply to different stockings within the lot. It frequently happens that variations occur within the same article. The legs may be of a different shade from the foot or a sharp color variation may be apparent as a line following the stitch across the merchandise, with the color uniform on each side of the line. This defect suggests that a different quality of silk has been employed in knitting the leg on each side of the line and such is invariably the case. We almost always find a knot at the color junction line.

The color irregularities can most generally be traced to one or more of the following factors:

1. Lack of silk filament regularity.
2. Alkalinity employed in reeling and throwing.
3. Type of dyestuffs employed in the dyeing operation.

SILK FILAMENT IRREGULARITY

Nature abhors uniformity. Nothing that she creates is precisely identical with any other element in nature. Every member of every genus or species is a distinct and separate entity possessed with its own characteristic idiosyncrasies. By scientific in- and cross-breedings the individual physical variations in a species can be minimized or rendered nugatory for most industrial purposes.

Silk worms are nature's product and as such are individual entities and show the same idiosyncrasies in structure and behavior as do the higher forms of life. As a consequence, no two filaments are precisely identical. There are irregularities in the size and shape of the strands, ratio differences between the sericin and fibroin on raw silk and even slight differences in the chemical composition of the silky matter. It has been suspected that these differences account for the troublesome two-tone effect and the differences in shade that all hosiery dyers experience in a lot of silk from time to time.

The writer has investigated this factor, but contrary to his expectations found that neither the nature of the silk, its age, or the quality of either the silk or its sericin integument was responsible in any way for the fibers acquiring a different coefficient of dye adsorption.

Mennerick, who studied the same problem, examined filament cross-sections and noted that whenever adjoining threads show color differences he was always able to detect variations in their filament diameter or shape.

These variations are one of the most potent sources of two-tones. The writer has found that if the average diameter of the filaments or a yarn differ more than five per cent from the average, that yarn will assume a differ-

*Presented at meeting, Piedmont Section, Nov. 6, 1937.
†Director of Research, Onyx Oil & Chemical Co.

ent tone and be lighter or darker than standard, depending upon the type of dye employed.

Silk filaments likewise show variations in shape as well as diameter size. Silk derived from the spring crop is almost invariably flatter and more ribbon-like than the silk derived from later hatchings, and this irregularity is just as potent a source of two-tone as differences in diameter.

The heterogeneity of filaments as regards uniformity of size and shape is the rule, not the exception. China silk is generally finer in diameter than Japanese or European, and yarn derived from worms hatched in the spring is usually flatter and of coarser diameter than filaments obtained from later hatchings. Variations exist even among the different sericultural districts in Japan and even among cocoons reared on the same plantation.

The magnitude of the tendency of cocoon filaments to possess inherent two-tone potentialities may be gleaned from the fact that even under the most approved sericultural conditions on the same plantation, over ten per cent of the strands produced show sufficient variations in size and shape to cause dyeing irregularities.

Consequently, we might expect a much greater percentage of irregularly dyed merchandise than experience has shown. That the defect is not more numerous results from the fact that silk materials are derived from multi-filament yarn. The raw silk of commerce is made from six or more tiny cocoon strands and some three or more of these are compounded to yield the knitting yarns of commerce. The presence of but one or two-substandard filaments in the yarn will not cause a two-tone effect. It is only when the majority of strands deviate from type by over five per cent or are of sub-standard shape that abnormal dyeing properties are imparted to this yarn.

By grouping in one bale of raw silk only that derived from a single filature and a single plantation, and by employing such lots for a specific customer, the throwster has been able to reduce the number of two-toned hosiery to a minimum. In spite of all these precautions, however, some defective merchandise will always occur.

I have here an example of hosiery which illustrates this two-toned condition. The legs of the hose were prepared from two skeins of thrown silk which differ in diameter as much as ten per cent. The hose was degummed in the conventional boil-off and dyeing solutions. It is very apparent where the two yarns are joined together in the hose. A sharp line of color demarcation is obvious at the point of union.

The correction of this defect is impossible. The addition of levelling agents, penetrants and even mordants is of no avail. The apparent color difference is not due to a difference in the coefficient of color adsorption but to variations in light adsorption and reflection. The effect is more optical than real. Such unlevelness has always occurred and until man can induce the silk worm to throw his cocoon according to set standards and patterns, the dyer will be troubled with an occasional two-tone, and a few stockings from the same lot, although even in themselves, will deviate from the standard.

ALKALI AS A SOURCE OF TWO-TONE

Raw silk is composed of an inner core of fibroin or silk matter sheathed in an integument of emulsifiable proteins technically known as sericin or silk gum. This envelopment, more or less plastic in nature, contains distributed through its substance small amounts of waxes and oils and perceptible amounts of ash bearing calcium and magnesium salts.

The natural size is a harsh, stiff, horn-like substance which masks those alluring characteristics of brilliance, softness and richness which have always rendered silk in such esteem. The sericin, however, is not merely a raw silk impurity. It acts as a natural size and can protect the delicate fibroin fibers against the abrasive action of the throwing and knitting operations. Throwsters and knitters avail themselves of this property and generally fabricate their merchandise with the sericin intact about the fibroin core.

However, sericin does not act as a perfect size. It is too harsh and stiff to throw and knit properly. The natural size must be lubricated, plasticized and rendered hygroscopic. The character of the auxiliaries, added to the raw silk to impart these properties, may profoundly influence the dyeing and finishing operations.

Almost since the inception of mechanical knitting, raw silk, prior to throwing, was soaked in a soap-oil emulsion, the lubricant generally being of olive or neatsfoot base. Raw silk so prepared functions fairly well for weaving purposes but has never been satisfactory for knitting. It lacks the necessary lubricating and hygroscopic properties to operate properly on the knitting machines.

The impartment of this requisite lubricity and hygroscopicity has been the subjects of many studies and is being accomplished in a variety of ways. Most of such experimentation has been instigated to facilitate and aid the throwster and knitter without regard to any involved problems that might accrue to the dyer. The dyer is too frequently regarded as a magician capable of correcting and curing all hosiery ills.

The consequence of studies in throwing oils has been the gradual replacement of the older type of lubricants by newer and more potent reagents. The substitution of oils bearing hydroxyl and unsaturated groups for neatsfoot and olive in the throwing bath has resulted in a more plastic and better lubricated raw silk, particularly where suitable qualities of mineral oil have been incorporated into the oil. Improved hygroscopicity can be imparted in various ways but a highly alkaline bath is at present most popular, due, wtihout doubt, to its relatively low cost.

It is these highly alkaline throwing baths that are of greatest interest to the dyer.

Raw silk is composed of an inner core of fibroin or

silky matter developed in a sheathe of proteins popularly known as sericin. The sericin is not a single chemical individual, but consists of three fractions which are stratified in three layers about the fibroin. The outer core or ring consists largely of two proteins which the writer has called Sericins A and B.

Adjacent to the core of silk is an inner ring of protein similar to, if not identical with silk itself. It is probably unorganized fibroin as it has about the same color adsorption and solubility while between the inner and outer sericin section lies a narrow band consisting largely of pigments and ash constituents.

Both the fibroin and sericin are proteins and as such are amphoteric and have the ability of uniting with both acids and bases to form salts, often with an alteration and rearrangement of chemical structure.

When raw silk is exposed to a throwing bath containing from one to ten per cent of soda ash or its equivalent, the first action is a neutralization of the acidic properties of both the sericin and the fibroin. Both proteins swell and the less soluble Sericin B is gradually degraded into simpler protein bodies of greater hygroscopicity, but the action does not cease with a simple alteration of the sericin. Slower changes likewise occur on the fibroin. The fibroin suffers molecular rearrangements and acquires an enhanced affinity for dyestuffs.

Conventional soaking procedures are not conducive to uniform acquisition of either alkalinity or throwing oils and considerable fluctuation in the amount of chemical acquired by skeins of silk in the same soaking bath is customary. Where the alkali deviates considerably between the skeins in the bath, hosiery knitted from the silk may exhibit a very different coefficient for hosiery dyes and it might be possible to select as many as ten shades from the same dye lot.

I have prepared for your inspection ten finished hose which illustrate the influence of varying degrees of alkalinity in the throwing bath on the subsequent dyeing operation.

Five skeins of raw silk were selected from the same bale and subjected to throwing solutions differing only in the degree of alkalinity. The solutions were adjusted and maintained at a definite pH value throughout the operation. These values were affixed at 6, 7, 8, 9, and 10, respectively. The skeins were then extracted, thrown into hosiery yarn and knitted into hose. The hose was then boiled off and dyed together in the same dye liquor. An examination of the finished product illustrates only too clearly the variations in shade which resulted. It is readily apparent that where raw silk contains alkali the product will acquire more color than the same type of stock containing lesser amounts.

Two-tones resulting from variations in the alkaline contents of the hosiery in a boil-off bath are easier to correct than unlevel dyeings resulting from irregularities in the shape and diameters of the component filaments. It is not to be assumed, however, that levelling is easily accomplished. It is quite the contrary. In most cases it is not levelled at all. The lot is sorted to shade and the cause assigned to some unidentified factor.

However, most such lots can be levelled. All that is required is a relatively high pH value in the dye-bath and the presence of a potent dye retarder and leveller. The latter two alone will correct alkaline-induced irregularities in most cases.

There are, unfortunately, very few compounds that possess the requisite levelling properties.

DYE IRREGULARITIES RESULTING FROM DYE REDUCTION

No discussion on hosiery processing would be complete without reference to dye reduction. One of the most potent sources of difficulties has been the tendency of certain of the shades to reduce in the dye liquor. I allude to the Sulfocyanine Blacks and Blues and to a lesser degree to the Silk Browns. The destruction of these colors has been traced to the combined action of alkalinity, silk gum, elevated dyeing temperatures and metallic colloids. The color destruction throughout the bath is frequently by no means uniform. Certain hose apparently is able to absorb the dyestuff and maintain it in an un-reduced form whereas others seemingly act as dye reducers and destroy the colors rapidly. The varying tendency of hose to destroy the Sulfocyanine Blacks and Blues is a potent cause of unlevelness.

The writer has traced this condition in several cases to the presence of metallic catalysts on the silk.

Numerous attempts have been made to overcome the inherent shortcomings of the dyestuffs by leaving the covers of the machines open and by bubbling air through the liquor. Such efforts, though partially successful, owe whatever virtue they possess to the cooling of the dye liquor.

Your writer has made a particular study of this subject. He has found that the reducing action on the dye is due to solubilized proteins catalyzed by high temperature, alkalinity and metallic ions. In a patent shortly to be issued, a full disclosure of means to correct this reduction will appear.

OIL SPOTS AND NIGER HEADS

Silk hosiery is generally prepared with the sericin intact about the fibroin or silky matter. The gum is invariably lubricated, plasticized and rendered hygroscopic by auxiliaries added by the throwster to promote the throwing and knitting operations.

This plasticized integument, which frequently carries as much as twelve or fifteen per cent of the weight of the silk as oil, obscures the natural brilliance, softness and sheen of the fiber, prevents the hose from acquiring dyestuffs properly and must be eliminated.

This was, until recently, a relatively simple operation. Most hosiery was, judging by modern standards, heavy

substantial merchandise capable of withstanding much abuse both in wearing qualities and in processing.

The throwing oils were simple emulsions of soap and emulsifiable oils, usually olive or neatsfoot. No particular problems in processing existed. The material resisted the conventional boil-off procedures without chafeing and the throwing oils emulsified easly in soap and alkaline solutions.

The degumming agent was invariably soap and the two-bath method of stripping was in almost universal vogue.

Oil spots and niger heads occasionally occurred but these most generally developed in the operations subsequent to degumming and resulted from union of residual soap on the silk with the elements of hardness in either the rinse or dye liquors; but the old order changed.

Fashion replaced the heavy silken stockings with merchandise of greater and greater fragility. Heavy service weight hose was supplanted by service and these in turn by chiffons and sheers. The changes necessitated revisions in the art of processing. The lighter yarns, required for the more delicate fabrics, demanded raw silk of greater lubricity, pliability and hygroscopicity to knit into an acceptable stitch. The older soaking solutions no longer sufficed.

The acquisition of the new requirements was accomplished by the substitution of oils bearing hydroxyl radicles and unsaturated valences for the raw neatsfoot or olive oil with additions of mineral oil and considerable amounts of alkalies particularly sodium carbonate or its equivalent.

The changes in the type of hosiery and the chemicals employed to facilitate throwing have profoundly altered degumming and dyeing procedures.

The older two-bath method was no longer adequate. The throwing oils in use today are eliminated from silk with much greater difficulty than the olive and neatsfoot.

The fragile construction of much of the hosiery in use requires protective colloids to prevent chafeing and rub marks and the alkalies used in throwing are gradually making the boil-off operation one of oil emulsification rather than a process intended for sericin elimination. In fact, some of the raw hose on the market today can be stripped of its sericin by water alone.

The first step in processing silk hosiery is the elimination of all extraneous matter from the fibroin. This involves the solubilization of the sericin and emulsification of extraneous oils and auxiliaries.

The former is accomplished by alkalinity and elevated temperatures. The amount of alkalinity is important. Sericin is incompletely eliminated unless the degumming solution acquires and is maintained at a pH in excess of 9.2 or 9.3 throughout the period of active degumming. The upper hydrogen ion concentration should not exceed 10.2, lest the fibroin or silky matter experience degradation. This limits the pH of the degumming bath between well-defined limitations. The mere acquisition of a proper initial pH is not a sufficient check on the virtue of the solution. Raw silk is acid and the acidity of the fabric neutralizes the alkalinity of the stripping agent. There must be sufficient alkaline reserve to maintain the bath at the proper pH throughout the period of active degumming.

Formerly, very considerable amounts were required, but in present throwing practices much of the natural acidity has been destroyed and in some cases hosiery actually has an excess with the result that much less alkali need be present than formerly.

Although less alkali is required, the elimination and maintainance of throwing oils assumes much greater importance. Whereas most niger heads formerly could be traced to lime soap deposits, today most can be traced to incompletely dispersed throwing oils. Many of such oils are semi-drying and require rather potent emulsificants to maintain them in a dispersed state, particularly when they are associated with certain qualities of mineral oil. The removal of many such oils by soap solutions is a difficult accomplishment and has necessitated the incorporation of more effective scouring agents or at least chemicals of greater ability at maintaining these oils in a dispersed state. The better qualities of sulfated oils and fat alcohols as well as blends of such oils with cresylic acid, pine oil, tetralin, hexalin, the pyridines and cellosolves have received application for this purpose.

Such reagents form transcient films about the peripheries of the silk filaments dissolving out the difficultly soluble semi-drying, mineral and oxidized oils. The films, however, are of temporary character and when they again enter solution carry the vitiating oils.

It was previously stated that all that was required for sericin solubilization was the acquisition and maintenance of a pH between 9.2 and 10.2 during the period of active degumming. That should not be interpreted as implying that all stripping agents which will yield these values are equally serviceable. As far as sericin elimination and fibroin deterioration are concerned, however, such is actually the case.

FIBER PROTECTORANTS

But much of the hose in use today lacks the ability to withstand the mechanical friction of rubbing induced in the degumming and dyeing liquors. As a requirement, protective colloids in the bath are desirable.

The sericin of raw silk is composed of two main fractions, Sericin A and Sericin B. Sericin B is a protective colloid of the type required to secure fiber protection. Sericin A, however, lacks these protective properties.

Sericin B is a relatively unstable substance and is gradually transformed during degumming into Sericin A. The conversion depends not on pH alone but on the type and character of the degumming agent. Some, particularly most mineral salts, accelerate the change, others retard or restrict the conversion. That accounts for the superiority of some degumming agents over others of the same pH and alkaline reserve and explains the popularity of the single and split-bath processes over the old two-bath method.

The presence of Sericin B in the dyebath acts as a protectorant against the abrasive action of the bags and the rubbing of fibers against each other in the liquor.

It is not to be understood, however, that Sericin B is the sole colloid serviceable or the sole protectorant for silk against friction marks and chafe. Soaps, emulsified and sulfonated oils, sulfated fatty alcohols, and to a lesser degree, the fatty acid condensates, possess merit.

Many new protective colloids of enhanced value have recently been prepared and utilized from both the natural and synthetic fields and are beginning to receive utilization in hosiery processing.

INFLUENCE OF RESIDUAL SERICIN ON HOSIERY HAND

I have reserved for the last element of discussion, a factor apparently but little appreciated or understood by the average hosiery dyer, namely, the influence of residual sericin upon the final handle and quality of boiled-off hose.

Raw silk, as has been aforestated, is composed of an inner core of fibroin or silky matter sheathed in an integument of emulsifiable proteins technically known as sericin or silk gum. The sericin is not a single chemical individual but is a mixture of three proteins which arrange themselves in two concentric rings about the fibroin with a minute layer of ash and natural pigment between. The outer layer which comprises almost ninety per cent of the total envelopment is waste or gangue material which must be completeyl eliminated in order to promote clear and level dyeings. The ash is also an objectionable waste which generally is removed with the outer sericin components. The innermost fraction of the gum, however, is of very different nature from the outer layers. This moiety is similar to silk, absorbs dyestuffs with the same avidity and acts as a natural size imparting weight and body. Fortunately, it resists elimination much more tenaciously than the Sericin A and B, and if the degumming and dyeing is carefully controlled can be maintained almost intact upon the hose. This is not always possible. It frequently happens that silk hose is of non-uniform construction. The heels, toes and seams are of such dense structure that the removal of the extraneous matter from these parts results in a complete removal of all vitiants from the hose body. In brief, the material must be overtreated in order to purify the denser portions of the fabric.

Wherever possible, however, and that includes hose on which the silk construction is uniform throughout, with the heels, tops and toes being of cotton or rayon, the dyer can, by adjusting his boil-off formula, secure three types of final product.

This can be accomplished by leaving his Sericin C, which is the name the speaker has assigned to the innermost fraction of silk gum, intact about the fiber, leaving a smaller fraction of the "C" on the yarn, or effecting its complete elimination.

The presence of the total Sericin C content upon the silk produces a crisp, crepey handle and a superior weaving article of commerce. Paradoxically as it may seem, a small residue of sericin on degummed silk yields a soft, raggy hand whereas a full, scroopy hand is secured on silk free from sericin.

THREE TYPES OF PROCESSING

There are three general types of hosiery processing today, the so-called two-bath, split-bath and single-bath processes.

The two-bath method accomplishes the elimination of the sericin and extraneous matter in a preliminary operation and completes the dyeing operation in a subsequent liquor. Its virtue lies in the fact that the stock is free from extraneous impurities when it enters the dye solution, and hence yields a clearer, cleaner final color shade. However, this supposed virtue is theoretical rather than real. Convention decrees a full, delustered hand and these properties are secured upon hose processed by the double-bath method only upon use of considerably more chemical in finishing than that demanded for hosiery given either a split or single-bath operation.

Moreover, the dyebath requires special dispersing and protective agents. The elimination of oils and other impurities is rarely complete in degumming. The residual impurities are eliminated in the subsequent dyebath and unless detergents are present with the dyestuff, oil-spots and niger heads are likely.

Hose likewise is subject to chafe due to friction and as the dyebath is free from protective colloids, hose dyed in the double-bath process is generally much more apt to exhibit chafe and rob marks unless protective colloids are added to the dyebath, a costly procedure.

This method which is rapidly becoming obsolete is slow, costly, and likely to yield inferior merchandise.

The two methods of boil-off today are the single-bath and split-bath processes. The degumming and dyeing operations are conducted simultaneously in the former, whereas in the latter the hose is largely freed from its throwing oils in a preliminary operation, while the dyeing operation results in a concordant elimination of sericin conducted in a second bath. Each method has its special advocates.

The proponents of the single-bath method contend that the operation produces a more evenly dyed hose with less chafeing as all of the sericin and soaps and oils employed in throwing are present as protective colloids. They also contend that a firmer and more easily regulated hand can be secured since it is easier to adjust the boil-off so as to leave any desired sericin content upon the hose, and, of course, that production per unit of equipment can be increased.

The advocates of the split-bath method maintain that the elimination of the vitiating throwing oils and a portion of the sericin in a preliminary bath, renders the second bath freer from the progenitors of oil spots and that niger

heads and spots are also reduced. They also claim that the method permits of the securing of bright and cleaner shades.

It is probable that by proper control either method will furnish satisfactory, if not optimal results. No danger of oil spots should be present in the single-bath method if proper oil dispersers are present and chafeing need be no more prevalent in the split than single-bath method, if proper protective colloids are present in the split-bath boil-off compound.

In general, our studies have shown that for silk hosiery boil-off the degumming solution should possess the following characteristics:

1. Possess an initial pH not greater than 10.5.
2. Have sufficient alkaline reserve to maintain the pH above 9.2 during the period of active degumming.
3. Produce a minimum of Sericin B degradation.
4. Maintain all throwing and needle oils in an emulsified state.
5. Suspend all metallic soaps in a dispersed state.
6. Contain dye stabilizing agents with which to prevent reduction of hosiery dyes.
7. Where necessary, have present colloidal protectorants to prevent filament chafeing.
8. Where necessary, have present dye levellers to neutralize that unlevelness of dye affinity induced by variable conditions of alkalinity in the lot of hose.

It is axiomatic that those hosiery dye houses which have been most successful are those that adhere most closely to the precepts of theoretical degumming operations and for obvious reasons. The silk degumming process implants its effect upon all goods so processed and its effects are permanent. Defects produced in bleaching, dyeing, or finishing can in most cases be corrected in subsequent operations, but a boil-off defect when once developed will remain on the hose throughout its life influencing all subsequent operations as well as determining whether that hose will be a quality product of long life or an inferior article possessed of inferior wearing qualities.

DISCUSSION

Mr. Smith: I am going to ask Mr. Grady Miller of the Elliott Knitting Mills of Hickory, N. C., to lead this discussion and bring out all questions he can, as well as ask questions himself.

Mr. Miller: What are the nature of the compounds that have a leveling effect on silk hosiery?

Dr. Mosher: I presume you mean reagents which have the ability to level the dyes on hose which have an inherent tendency to form two-tones. Most of these are rather complex amino compounds which have been recently synthesized. These compounds have the ability to retard dye absorption and level the color on hose fabrics, the fibroin of which has been partially changed by high alkalinity. There are but few products suitable for this purpose on the market but their use is likely to be extended.

Mr. Miller: Would you say that the silk tints are responsible for two-tone effect?

Dr. Mosher: If the tints are properly applied and of suitable quality they should be thoroughly removed in the boil-off bath and not be a causative factor for two-tone development. Unfortunately, many of the tints employed are not as fugitive as they should be. Some likewise are set to a greater or lesser degree during processing and when this is the case tints may produce a two-tone effect. However, if proper tints are employed in throwing, they should not give rise to two-tone effects.

Mr. Miller: If a mill should have more than one shipment of silk and should mix the spring shipment with the other shipments, would the mixed lots give rise to two shades?

Dr. Mosher: Almost invariably. Spring silk will dye one shade and silk reared in the fall another. Throwsters, however, exert care in avoiding any mixing of lots.

Mr. Miller: I have found the heavier the hose the easier it is to chafe. What would you say causes chafe or rub marks in dyeing? One might say that a 10 or 12 thread hose would chafe easily whereas a 3 or 4 thread would stand up better.

Dr. Mosher: While that is true, there are many reasons to account for it. The heavier threads require more work in dyeing to secure proper dye penetration and leveling. Also, the weight of the hose causes it to drag more against the back and sides of the dyeing receptacle. Recently, throwsters are employing higher alkalinity and this alkalinity tends to render the silk more subject to chafing and hence more sensitive to injury due to rubbing.

Mr. Miller: Does high strand silk, that is, silk composed of 14 or 15 filaments, have a higher alkalinity than low strand?

Dr. Mosher: Not necessarily, oftentimes not as high.

Mr. Miller: After the hose has been chafed, how can you get rid of it? Of course, we can use water repellants and mineral oils but can you suggest any other materials which will help?

Dr. Mosher: After you have chafed the material about all you can do is to get a size that will cover it and attach the exfoliated fibrillae to the surface of the material. A waterproofing agent is helpful in many cases. Shrinking likewise tends to mask rub marks but in most any case chafing re-develops after the hose has been worn and washed.

Mr. Miller: Why do Silk Blacks reduce more readily in some machines than in others?

Dr. Mosher: That can be due to a variety of reasons. One of the most potent causes probably is the presence of metallic colloids. Where several machines are in use, it may happen that one machine is old and is scaling off metallic particles. These particles may be almost microscopic in size and may settle on a hose, act as a catalyst, and destroy the Sulfocyanine Blacks. The reason why some boil-off compounds reduce colors to a greater degree than others can often be traced to the fact that they

corrode the metal of the dye receptacle to a greater degree than others.

Mr. Miller: You mentioned that you are working on something which will take care of this break-down. Do you think that this device will overcome the break-down of Sulfocyanine Blacks?

Dr. Mosher: Yes.

Mr. Miller: We are all looking forward to that if it will help us. Does anyone here have questions they wish to ask Dr. Mosher?

Mr. Kenney: From the standpoint of level dyeing what would you consider the ideal pH for a throwing bath?

Dr. Mosher: The ideal pH is different for a throwing bath than the ideal pH for level dyeing. The throwster wants a direct running silk. This involves the formation of a hygroscopic silk and hygroscopicity is accomplished by high alkalinity. For knitting, a pH as high as 9.6 is desirable but for level dyeing silk a pH as low as 8.0 is most desirable.

Mr. Kenney: Is thrown silk ever produced at a pH as high as 9.6?

Dr. Mosher: I have received samples as high as 10.6.

Mr. Kenney: I would like information as to the limit at which a throwster should work to get a good running silk and at the same time assist the dyer in a subsequent operation. It is very possible to add combinations of alkali which will reduce the pH below 9.0 and secure a good running silk. It is hygroscopic enough to knit properly and yet not be objectionable from a dyeing angle. Such as combinations of carbonate and bicarbonate.

Dr. Mosher: Although combinations of carbonate and bicarbonate when freshly prepared may easily bring a pH below 9.0, sodium bicarbonate is an unstable compound and decomposes readily to form the carbonate. The mere fact that such a combination has a pH below 9.0 does not necessarily mean that the pH will be below this value after the material has dried. Sodium bicarbonate decomposes spontaneously into sodium carbonate at something like 160° F.

Mr. Kenney: We do not soak at as high a temperature as that.

Dr. Mosher: At lower temperatures the decomposition is slower than the formation of carbonate less rapid but carbonate formation will invariably occur.

Mr. Kenney: Have you had any experience that indicates that the pH of thrown silk will become less alkaline during ageing?

Dr. Masher: Thrown silk always shows a decreasing pH during ageing. The loss af alkalinity is generally due to gradual neutralization of both the fibroin and sericin, possibly accompanied with molecular rearrangements.

Mr. Kenney: What is the cause of that? Is it a peptonizing of the sericin?

Dr. Mosher: It is due to a change of both the sericin and fibroin. Where the fibroin suffers from molecular rearrangements its absorption of dyestuff is altered. If the silk possesses a uniform pH even though a molecular rearrangement has occurred the dyeing properties should be level. With a molecular rearrangement, however, the silk shows a greater tendency to chafe.

Member: What other chemicals can render silk hygroscopic besides alkalinity?

Dr. Mosher: Many silk wetting agents such as the sulfonated boro esters of fat alcohols, fatty acid condensates, etc.

Mr. Gaede: Do you consider the complete elimination of alkali in a silk soaking bath desirable?

Dr. Mosher: No. If the silk is on the acid side it will attack knitting needles. For that reason it is necessary to have your bath on the alkaline side.

Mr. Baker: Have you made any experiments to determine what the pH danger limit is in soaking?

Dr. Mosher: I would fix that point at somewhere between 9.5 and 10.00.

Mr. Gaede: I would like to ask Dr. Mosher if there is any relation other than pH, as to the amount of alkalinity and damage.

Dr. Mosher: Yes. An excessive amount of alkaline salts will tend to affix tints and might even insolubilize sericin.

Mr. Gaede: Assuming that a soaking bath contains reagents to produce proper hygroscopicity, what would you consider the proper pH of the silk soaking bath?

Dr. Mosher: A pH value of about 8.0 or 8.1.

Mr. Gaede: After soaking the silk?

Dr. Mosher: Yes.

Mr. Stone: Dr. Mosher in his paper mentioned semi-drying oils in one of the processes. I would like him to name the oils used that are semi-drying.

Dr. Mosher: There are many semi-drying oils which may be used on textiles with perfect safety providing they are properly prepared and providing they contain suitable anti-oxidants and protectorants which will prevent them from hardening or becoming rancid during prolonged ageing. Strictly speaking, most any oil containing a considerable amount of the oleic acid glycerides might be classified as semi-drying. That might even include an olive or neatsfoot oil which we all know are perfectly safe. These oils are satisfactory because certain impurities in them render them resistant against ageing changes. Properly protected, even an oil such as cottonseed might be satisfactory for use if it is properly prepared and properly stabilized and rendered resistant against oxidation by suitable auxiliaries. Ordinarily, most any oil with an iodine number under 100 is suitable for textile use if it is scientifically and intelligently augmented with suitable protectorants. I would view with scepticism any textile oil with an iodine number higher than 100 even though some may and can be used. The choice of the oil depends more on its intelligent preparation and application than any exact chemical figure to determine whether it is suitable or not.

Some Properties of

Cellulose Acetate Rayon Fibers

of Interest to Dyers and Finishers*

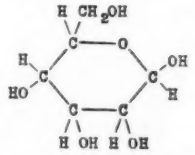
HAROLD DeWITT SMITH†

THERE is no fundamental difference in the chemical nature of cellulose acetate continuous filaments and cellulose acetate staple fiber and hence no fundamental difference in the behavior towards dyes of these two forms of cellulose acetate textiles. Their reactions with chemicals and to the procedures used in finishing are also essentially the same. The variations in finishing technique to be used on various acetate fabrics depend entirely upon the nature of the fabric and the physical form of the fibers rather than upon any chemical differences in the material of which the fibers are composed.

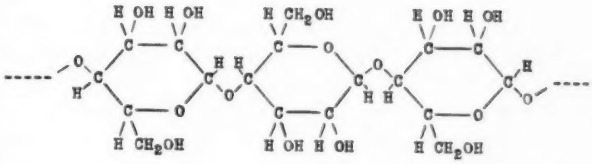
Acetate rayon fibers or filaments are composed of an organic substance, cellulose acetate, which is truly synthetic since it does not occur in nature. It is a compound formed by the chemical combination of acetic acid and cellulose.

Such a compound, formed by the reaction of an acid with an alcohol (cellulose has three hydroxyl groups per $C_6H_{10}O_5$ and behaves chemically like a polyhydric alcohol), is called an ester and is analogous to a salt. An ester differs completely from either of the constituents from which it is formed, just as a salt such as sodium acetate differs completely from both the acid and the base from which it is formed.

Living plants utilize carbon dioxide and water, which combine under the influence of sunlight and chlorophyl, to form sugars such as glucose whose structural form is



From this sugar, cellulose is formed in the plant by the joining together of these glucose rings (with the elimination of water) to form long chains. In the process of combining, two of the five hydroxyls on each ring are eliminated so that in cellulose there are three available hydroxyl groups per $C_6H_{10}O_5$. The structural formula of cellulose is represented as follows:



These hydroxyl groups along the sides of the cellulose chains appear to be the most reactive points. When cellulose reacts with acids to form esters, the acyl groups attach themselves at these points with the elimination of water.

The analogy between the formation of a salt, the formation of a simple ester, and the formation of cellulose acetate is as follows:

$$Na\boxed{OH} + \boxed{CH_3COO}H = CH_3COONa + H_2O$$

(Sodium Acetate)

$$C_2H_5\boxed{OH} + \boxed{CH_3COO}H = CH_3COOC_2H_5 + H_2O$$

(Ethyl Acetate)

$$C_5H_7O_2\begin{Bmatrix}\boxed{OH}\\ \boxed{OH}\\ \boxed{OH}\end{Bmatrix} + \begin{Bmatrix}\boxed{CH_3COO}H\\ \boxed{CH_3COO}H\\ \boxed{CH_3COO}H\end{Bmatrix} = \begin{matrix}CH_3COO\\ CH_3COO\\ CH_3COO\end{matrix}C_5H_7O_2 + 3H_2O$$

(Cellulose Triacetate)

This last reaction is actually accomplished by using acetic anhydride which is a more powerful reagent than acetic acid. The triacetate so formed is not suitable for textile fibers and other commercial purposes, Hence while still in the labile or active state it is hydrolyzed under controlled conditions until it attains the exact composition desired which is approximately the diacetate. This reaction may be represented thus:

$$\begin{matrix}CH_3COO\\ CH_3COO\\ CH_3COO\end{matrix}C_5H_7O_2 + H_2O = \begin{matrix}CH_3COO\\ CH_3COO\\ HO\end{matrix}C_5H_7O_2 + CH_3COOH$$

It is interesting to note that while man, on the one hand, has not yet duplicated Nature's feat of building cellulose out of glucost units; Nature, on the other hand has never accomplished the synthesis of cellulose acetate, one of the most interesting and valuable products of modern chemistry.

Because cellulose acetate, when in the form of filaments

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or fibers, resembles, superficially, filaments or fibers of cellulose such as viscose or cotton, we are apt to forget that the difference between cellulose acetate and cellulose are as signicant as the more obvious differences between cellulose actate and acetic acid and that acetate rayon is in fact, as well as in name, a distinct substance with distinctive physical and chemical properties quite different from those of all other textile fibers both natural and man-made.

Of the various properties of cellulose acetate, which differ markedly from those of cellulose, I would like to stress three which are of major importance in determining the behavior of acetate rayon textiles during the dyeing and finishing operations.

The first is

Hygroscopicity

All of the organic textile fibers both natural and artificial are hygroscopic; that is, they have an inherent affinity for moisture and possess the ability to absorb and retain an amount which is different for each kind of fiber in the same atmosphere. The amount retained by a given kind of fiber varies with variations in the relative humidity of the atmosphere. This absorbed moisture exerts a swelling action on the fiber substance, increasing its suppleness and affecting its strength.

Experimental data indicates that as the hydroxyl groups of cellulose are replaced by acetyl or other acyl groups the hygroscopicity and the swelling of the material by water is decreased.

In Table 1 the values of percent moisture regain in saturated air (100 per cent relative humidity) for the various types of cellulose and cellulose derivatives were determined by Sheppard and Newsome of the Kodak Research Laboratories.[1]

The figures for percent regain for silk and for wool (added for comparison) are averages of values given by several different investigators. The values of per cent swelling of the fiber cross-sectional area in water are approximate values representing the averages of several different investigators of fiber swelling.

TABLE I

Material	*Hygroscopicity (% regain at 100% R.H.)*	*Swelling in Water (Increase in cross sectional area as per cent of dry area)*
Cotton Linters	15	45
Cotton mercerized without tension	22.7	
Cuprammonium Rayon ..	23.5	60
Completely saponified Acetate rayon	26.6	65
Acetate rayon	15	10
Cellulose Triacetate	8.3	
Glucose pent-acetate	0.8	
Silk	30	40
Wool	45	40

The data in Table 1 illustrate two significant facts with respect to the hygroscopic properties of acetate rayon fibers:—(1) Whereas the hydration of native cellulose by alkali, or by solution and regeneration (as in the manufacture of cuprammonium or viscose rayon) causes an increased affinity for moisture, the new substance formed by acetylation of hydroxyl groups shows the opposite behavior, namely a decreased affinity for moisture. (2) The absorption of moisture is accompanied by swelling and the magnitude of the swelling is roughly proportional to the hygroscopicity. Hence the swelling of acetate rayon fibers is markedly less than that of the regeneratel cellullose types.

While Table 1 gives the moisture regains of various fibers at 100 per cent relative humidity, the data for the regain at all humidities, which has been published from from time to time in graph form, are more useful and instructive.

Such a graph for cotton, viscose and cellulose acetate is reproduced in Figure 1 from a paper by Urquhart and Eckersall[2]. The curve for wool is from Speakman and Cooper[3]. It will be noted that at all relative humidities the amount of moisture absorbed by cellulose acetate fibers is about one-half of that absorbed by viscose and is slightly less than that absorbed by cotton.

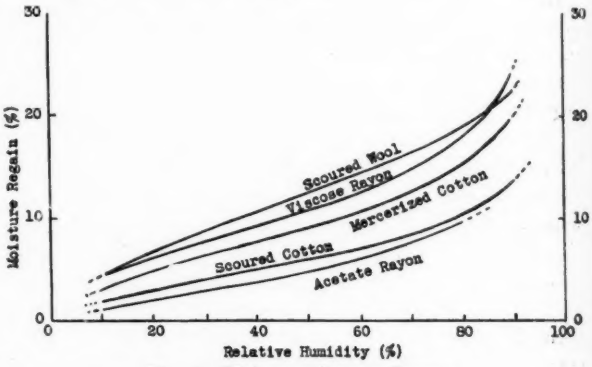

Fig. 1—Moisture Regain Curves. (Average of Absorption and Desorption Curves)

Most of the studies of moisture absorption by fibers have been carried out at ordinary room temperatures and hence do not show the behavior of the fiber when subjected to the higher temperatures used in dryers. The Drying Research study, which is now being conducted by the United States Institute for Textile Research, was undertaken to provide comprehensive data on this point.

However, the removal of all of the hygroscopic moisture from textile fibers, that is, drying to "bone-dryness", is known to be detrimental, for a fiber which has been thus completely dried does not reabsorb the normal amount of moisture when again exposed to atmospheric humidity. Pending the definite quantitative figures on the relation of fiber damage to residual moisture content, which the U. S. Institute's drying research study hopes to obtain, it is my opinion that, wool and viscose should not be dried below 5 per cent moisture regain nor cotton, silk and acetate below 2.5 per cent moisture regain.

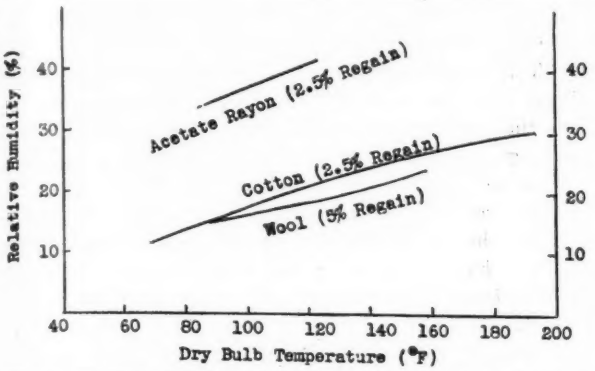

Fig. 2—Relative Humidity Required to Maintain Safe Moisture Regain at Higher Temperatures.

From the few data on moisture regain at elevated temperatures which have appeared to date in papers by Speakman and Cooper, Sheppard and Newsome, and by Urquhart and Williams, I have plotted the curves used in Figure 2 to show the relative humidity which must be present at various temperatures in order to maintain these minimum safe moisture contents in cotton, wool and acetate rayon textiles.

The practical significance of the above information on the hygroscopic behavior of acetate rayon as compared to that of other textile fibers is as follows:

1. Acetate rayon textiles wet out more slowly, hence the need for care to insure thorough, uniform, wetting and absorption of water before dyeing.

2. Acetate rayon textiles swell less than other fibers, and this is undoubtedly closely related to their behavior towards cotton, viscose rayon, and silk dyes. Of course, specific surface forces between dye and fiber undoubtedly affect the selectivity of acetate rayon for dyes but the lower swelling of acetate fibers plays a part because the pore space thus provided is apparently insufficient to permit the absorption of rayon dyes. This was demonstrated by Knoevenagel who showed that if acetate rayon is first swollen in alcohol which is next replaced by water, it will then dye with dyes which have no effect on acetate swollen in water alone[4].

3. The lower swelling and lower moisture absorption of acetate rayon results in less loss of strength in the wet state than in the case of viscose rayon, wool or silk.

4. The humidity required in a dryer to maintain a safe minimum moisture content is higher for acetate rayon than for cotton or wool and also undoubtedly than for viscose rayon. Overdrying of any fiber causes an irreversible harshness.

The second important property of cellulose acetate which I would like to discuss is

Thermoplasticity

One of the properties of cellulose acetate which has given acetate rayon the distinctive place it holds among the rayon fibers is its ability to take on a permanent pattern in finishing, as a moiré or other embossed pattern, or a polished ciré surface and also the permanent pleats and creases which can be pressed into women's and men's garments of acetate rayon. This property of thermoplasticity is the more interesting since it is accompanied by the good resilience or resistance to crushing which acetate rayon possesses at the temperatures to which acetate garments are subjected during wear.

In the finishing operations however this thermoplasticity of cellulose acetate must be kept in mind in order to produce the best results. The property was graphically demonstrated several years ago in a paper by Stahl[5] whose data is reproduced in Figure 3. Single ends of the various rayons were hung in a tall jar of water with a small weight on each to keep them under a small constant load. The length of these yarns was measured at various temperatures. Note that the regenerated rayons show a linear rate of extension with increasing temperature, whereas the linear extension of the acetate rayon begins to change in the neighborhood of 150° F. into a flow or stretch which increases in rate as the temperature increases. In the dry state this thermoplastic behavior starts at considerably higher temperatures but in the wet state it occurs in the range of temperatures employed in boil off and dyeing.

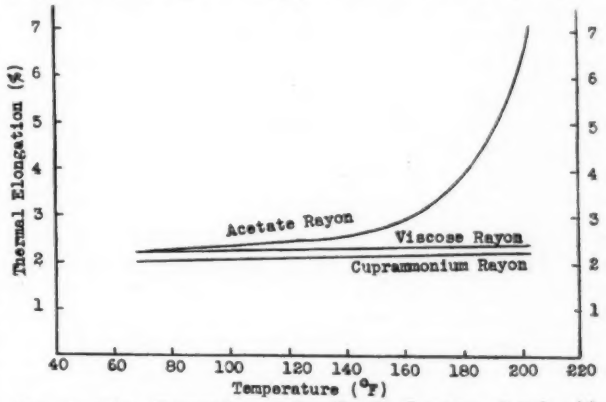

Fig. 3—Wet Elongation under Small Constant Load with Increasing Temperatures.

Therefore it is obvious that best results will be obtained by reducing tensions as far as possible in handling wet acetate goods; by avoiding the formation of standing creases in either wet or dry goods; and by avoiding high temperatures in boiling off and dyeing in order to prevent the thin, harsh hand which results from this plastic flowing and setting in the stretched state.

The third and last property of cellulose acetate which I would like to discuss tonight in its relation to the dyeing and finishing of acetate rayon is

Saponification

When the chemical compound-cellulose acetate is treated with alkalies, hydrolysis or saponification, as it is more commonly called, occurs. The cellulose acetate undergoes chemical decomposition into the substances of which it is composed, namely cellulose and acetic acid (which is of course neutralized by the alkali).

When cellulose acetate fibers first appeared on the market after the world war there were no dyes available which would dye them directly, therefore partial saponification was tried in order to regenerate sufficient cellulose on the surface of the fibers to give them an affinity for cotton or viscose dyes. Because this method proved incapable of satisfactory control of uniformity, intensive research on dyeing acetate rayon was undertaken and this development work led to the present method of dyeing with suitable dispersed dyes which are absorbed by cellulose. Since that time it has been common knowledge that the boiling-off and dyeing processes should be conducted so as to avoid such destruction of the cellulose acetate by hydrolysis.

Much work has been done on the production of acetate dyes which would be satisfactory for the discharge printing of acetate rayon. Such dyes are said to be available; nevertheless, whether because of cost of application or because of quality of results, a considerable amount of discharge printing on acetate and viscose rayon crepes is being done by the hydrolysis or saponification method which has been revived for this purpose.

Inasmuch as this method chemically alters and partially destroys the cellulose acetate itself, and inasmuch as it is a process which we who manufacture the cellulose acetate and the acetate rayon do not know how to adequately control on acetate rayon fibers, we are unable to accept responsibility for the unlevel dyeing, the loss in strength and other possible troubles which may arise from processing acetate rayon in this manner.

In this review of the nature of cellulose acetate I have tried to make clear to you that acetate rayon whether in the form of continuous filaments or staple fibers is as distinct from viscose rayon in chemical composition and properties as are wool or silk and to remind you again of some of the fundamental properties which you must understand and remember in order to successfully process acetate rayon fibers, yarns and fabrics.

There are other distinctive properties than those which I have emphasized but if you will keep in mind the behavior of cellulose acetate with respect to *moisture, heat* and *alkalies* you will be able to apply your own knowledge of the art and science of dyeing and finishing so as to produce the distinctive and unique effects obtainable with acetate rayon.

DISCUSSION

Mr. Smith: (Chairman) I would like to have discussion of this address and some questions from the audience.

Mr. Laurin: In regard to the question of creasing of acetate fabrics, I would like to ask Dr. Smith in regard to acetate taffetas received in the gray from the mills. Oftentimes they come with creases and those creases are very difficult, in fact almost impossible to remove. I was wondering if you had any ideas along methods that can be used to prevent those creases from coming up in the finished goods.

Dr. Smith: Without a doubt the best way to eliminate the creases is not to get them in! Even in the cool, dry state acetate has a tendency to flow. You all know how a rolled or creased paper will set in this shape after some time. If acetate rayon taffeta is held creased for a long time the crease will be similarly moulded in. If you swell those goods thoroughly with water, plus perhaps sulfonated oil or wetting agents, giving them plenty of time to swell, you have a better chance of getting the crease out, but the best procedure is to make a very strenuous effort to have the weaving mill wind the goods so they will not have creases. The taffeta construction is such a tight weave that the yarns have no play or give, as they have in a satin or crepe. Where your yarns are held as tightly as they are in the taffeta there is a much greater tendency for them to be displaced and bent so sharply that they cannot "come back" readily.

Mr. Laurin: When you are running the acetate on the jig you ordinarily run them through cold water, but if you get creases during the cold water operation before you bring up to high temperature, what is the reason that the creases develop? Is it due to the fact that the gelatin is not removed or is it due to the chemistry of the acetate fabric itself?

Dr. Smith: When the roll of fabric is not made up quite true it will form creases as it runs on the jig. If this condition is promptly corrected, creases which are formed thus should be removable much more readily than the creases that come to you in the gray goods and have been creased for days. It makes little difference whether the size is on there or not, because the size film is so small in relation to the filament itself that I do not think it plays a great part.

Mr. Laurin: Your crease is permanent if you run it into hot water?

Dr. Smith: In cold water the fibers wet out and swell more gradually, hence resist creasing better than in hot water. We have always felt that one or two ends through cold water to soften the gelatin is a very good investment in time, because you all know that gelatin put directly in hot water becomes insoluble.

Member: What do you consider the best method of dyeing for acetate print?

Dr. Smith: We do not know a best method. We know that saponification is far from being the best method in that it causes trouble with all acetate yarn and at unexpected times, due to the fact that it is a very difficult job to saponify all of the fibers evenly and to the same degree.

The dye manufacturers tell us they have a range of acetate dyes which will discharge satisfactorily, but the price of the discharging agent, plus the dyes, apparently make it unattractive commercially in competition with the discharge printing of all viscose rayon crepes.

I do not know the answer; either the cost of using dischargeable acetate dyes will be reduced or perhaps dyers will learn how to control the saponification process so that it is safe. Perhaps it is sufficiently satisfactory to them

at the present time, but the acetate rayon manufacturers feel that they cannot accept responsibility for troubles caused by this method of processing since their product is being destroyed to an extent that they cannot control. The technical journals and books have discussed the dangers of saponification ever since acetate rayon has been made, so that this behavior has long been common knowledge.

Mr. Laurin: In regard to the dyeing of piece goods on acetate, have you had any experience with dyes showing up darker on the edge?

Dr. Smith: We found definitely in the case of a taffeta several years ago which was shading off light on the selvage, that it was due to the use of dyes that did not exhaust at the same rate or same temperature. If your formula is composed of several dyes which are absorbed at different rates, then your selvage may dye differently because the roll is always cooler near the ends, or if your selvage is not made in the right thickness then the higher pressure as the roll builds up will squeeze the dye out at the selvages. Such factors will usually account for shading of the selvage on jig dyed goods.

Mr. Smith: If there are no more questions, I want to thank Dr. Smith very much.

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Some Fabric Defects

*Their Causes and Possible Prevention**

CHARLES J. HUBER†

IT would be rather presumptuous on my part to try to cover the whole range of fabric defects as they are found today, within the short time allotted to me this evening. In the good old days before synthetic fibers were used—when the number of different types of dyestuffs were relatively small and when our grandmothers were not so fickle—being quite content with one grosgrain for her Sunday best, the lot of the weaver and dyer must have been indeed a happy one. Think of having 1,200 looms clicking year in and year out the rythmic chant of a single style of fabric and selling it all with a big margin of profit in only twelve shades. Cotton, wool and silk were the common fibers used, each in its own field with fairly well defined boundaries and wide stretches of "no man's land."

But "time marches on" and brings with it new fibers, new dyes and finishes and many new problems. A few years ago we were quite certain we could identify and catalog all the different textile fibers including the four types of rayons by simply viewing their microscopic cross-section. Now we almost have a new synthetic fiber weekly with new physical and dyeing characteristics blended intimately with other fibers in a spun yarn. Small wonder when we get this yarn, even with specialized microscopic technique, staining and chemical treatment, that we almost need to "cross our fingers" in being positive in placing its constituents in their respective categories.

When it comes to constructing fabrics from the many types of yarns available, the number runs into the thousands and when we take into account the effects produced by slight changes in the physical or chemical conditions in the manufacturing processes, the final result gets beyond the comprehension of a mere mortal.

This pyramiding of the problem is shown in the excellent work done by your Mr. Macia in the study on crepe rayon fabrics where he limited his work to only one type of fabric construction. Here he states "This investigation demonstrated that it was possible to make commercially perfect cloth insofar as pebble uniformity is concerned from the yarns used if reasonable control is exercised over each operation from the first in the throwing plant to the last in the dyeing and finishing plant."

In the study of causes, cures and preventions of fabric defects, the manufacturer has a great advantage over a neutral testing laboratory who simply receives a sample of the defective merchandise. The manufacturer does or should know what has taken place in the particular sphere under his control. If he produces the yarn he should know it better than anyone else. The same is true in the various steps in weaving, scouring, embossing, printing, dyeing and finishing. On the other hand, a laboratory such as the United States Testing Company, Inc., has to start from scratch. We try to get all the history possible all along the line, samples of the yarns and fabrics at the various stages of production to locate definitely where the change takes place. Where this information is available, usually the cause of the defect can be definitely located and remedial steps recommended.

However, in most cases such accurate historical data is not available as too often the producer does not realize

*Presented at meeting, New York Section, January 28, 1938.
†Director of Laboratories, United States Testing Co., Inc.

that he has any defects in his goods until they are returned by the buyer for adjustment. It is then usually too late to get the documentary specimens or perhaps such evidence would not be to his advantage. Here it is only possible to draw general conclusions as to causes and remedies to be used, and are seldom entirely satisfactory to ourselves or our clients. It is for this reason that we often strongly advocate a mill survey to obtain unbiased information all along the production chain.

Tonight I want to cite a few typical cases selected from our files to show types of problems and methods of approach to determine the cause of the defect in a fabric and the steps to be taken so that it will not happen again.

CASE 1

To show the importance of proper sampling and why we like to do our own wherever feasible, I want to tell you of this incident.

A worsted yarn manufacturer brought to us two skeins of yarn—one as manufactured and the other as bleached and processed by his dyer. The latter showed many spots not in the other skein. Tests were made to determine the presence of various materials which might be the cause but all tests proved negative. However, the evidence was definite that the spots were the fault of the dyer—if the first sample was representative. Within the week we received two similar skeins from a dyer showing the untreated skein as spun was full of spots. To my mind there was no doubt that there were plenty of spotted and many unspotted skeins in the yarn which might be noted "the manufacturer's skein as is" and it all depended upon who picked the sample.

CASE 2

Here is a sample of fabric containing numerous short dark streaks in the filling yarn. Microscopic examination of the yarn shows insoluble foreign matter largely soot and dirt held together with grease. Treatment with hydrolytic enzyme followed by boiling in soap solution did not remove the stains. Neither could the stains be removed by sodium hydrosulfite and bleaching agents.

To prevent this trouble, better "house keeping" had to be done in the plant where the crepe filling yarn was thrown.

CASE 3

Warp streaks in this rayon fabric run parallel to the warp threads but show no repeat across the width of the piece. Tests of the threads from the streaky and normal sections showed the same rayon from microscopical study. Strength and elongation tests on these yarns showed a great difference indicating that somewhere in the processing, the threads from the streaky section were subjected to undue tension.

CASE 4

A black cotton silk ribbon shows warpwise grey streaks along the silk threads. Micro-chemical investigation showed streaks to be caused by the deposit of a non-crystalline ether soluble fusible organic material of a fatty nature. Extract from the cotton yarn gave a high content of fatty material. Extract from silk yarn gave a low content of thin oil, with a trace of soap. From these and other tests the conclusion was reached that the deposit had its origin in the cotton filling and migrated from there to the silk face in the finishing operation.

CASE 5

A stocking shows a definite change in color known as two-tone dyeing. Is this the dyer's fault? Tests show that the shape and size of the filaments of silk in the light and dark portion are very different. The light section had an average diameter of 11 microns and a diameter ratio of .71 while the dark section had an average diameter of 13 and a diameter ratio of .67. This showed definitely that the larger and flatter filaments dyed darker and that the cause of the two-tone was due to a mixture of lots of silk.

CASE 6

Loss of strength was found in a printed acetate warp dull viscose filled fabric and was stated to be caused by the pigment in the print. Samples of fabric were obtained in the grey and plain dyed as well as in the printed state. Careful study of the material showed much chafing and broken filaments in the filling yarn in both the plain dyed and printed fabrics and that these damaged places did not coincide with the dot pigment printing. The grey goods that was boiled-off and dyed in the laboratory showed no undue loss in strength. The trouble was found to be due to poor embossing before dyeing and printing.

CASE 7

Warp streaks in transparent velvets. This mill investigation was made when hundreds of pieces were being dyed daily toward the end of the summer from stock accumulated from weaving through the first eight months of the year. There was a big demand for light shades of blues, greens, pink, etc., and so many of the pieces showed warp streaks that it was called an "epidemic." The streaks were definitely parallel to the warp threads and were readily located in the pile. The production department of the plant was sure it was due to some mechanical trouble. But it was only by a laborious and tedious investigation that the trouble was definitely located. Piece numbers were traced back to the looms and it was found that the trouble could be traced to certain looms scattered throughout the mill. We even found mates in pieces (top and bottom) and found that the streaks matched perfectly. In following back the origin of the pile warps used on these looms it was finally found that rayon yarn over a year old had been mixed with a new lot just received. This is an old story but still in a pinch manufacturers will take a chance.

CASE 8

The silk filling yarn used in the back of a transparent velvet was blamed as the cause of filling bars. A careful study showed that the silk yarn in the barré places was the same in all its characteristics as that taken from the normal

goods but there was a definite increase in the count of picks. Further, while the pile height was the same, the tuft length of the pulled-out pile was greater in the barré section helping to increase the density of the fabric. The defect was due to improper functioning of the let-off or take-up motion in the loom for both the ground and the pile warp.

CASE 9

Another "epidemic" of trouble with transparent velvets was designated by the mill as "snake-marks." It seemed as if a family of six or eight snakes had crawled in formation roughly parallel to the length of the piece of goods. It was almost impossible to obtain any colors in the light shades. The marks showed a definite resist to dyes. In following the production from loom through the various steps to the finishing department there was no apparent cause that could be readily detected. Upon close examination it was finally found that the small holes in the selvage used to string the goods in the boil-off frames had a relation to the crests of the waves in the "snake-marks." In short we at last found that the goods were entered into the degumming bath in six or eight steps so as not to disturb or crush the pile and that the scum floating on top of the bath caused the resist in dyeing.

I have tried to give you here tonight, a few high spots in fabric defects, the methods used in locating their causes and the remedies recommended for their prevention. Almost every defect is a separate problem and requires intensive study for its rational solution.

DISCUSSION

Chairman Baxter: What you said about the various fibers which you are called upon to test shows how difficult it is going to be for Federal regulation of fiber identification—and most of you gentlemen who are in the dyeing end of the industry may have been called upon already to identify various cloths that you are dyeing and finishing, so they can be sold to the retail trade with tags which show all the contents of those cloths.

Mr. Zisman: If you are testing a certain defect, no specific defect—it may be a streak, a spot, or something else very peculiar, and you have made an investigation and have found what you believe to be the answer, is it your principle to see if you can duplicate that particular defect as a sort of confirmation?

Mr. Huber: We always try to duplicate the defect when it comes to spots, but when it comes to streaks which look as though they might be inherent in the warp thread, for instance, it is almost hopeless. After all, it is often a matter of opinion and the more data that you can pile up, the better off you are.

Mr. Zisman: I thought of that because in my experience I have done some testing, and sometimes I don't feel satisfied with my own opinion, even after due testing. I only feel satisfied if I can duplicate the defect at will.

I have particular reference to a certain type of streaks that may be due to the dyestuff itself, under particular conditions. It may have to do often with certain atmospheric conditions, for example, and in my experience I have found that the only positive test of a defect is when I can duplicate the thing at will.

Mr. Huber: I think it is always very essential to do that.

To go a little farther—and you will be interested in this because it applies particularly to hosiery. I mentioned that the shape and size of the silk filament as it is boiled off enters into the question of two-tone dyeing. We thought we had an absolute test when we had the difference in diameter ratios, and we put out a little pamphlet on this basis. In most cases we were right but we found one which did not conform to the rule. We found that we had to take into account the difference in diameters as well as the difference in diameter ratios and with these two factors we have been able to predict the tone of the dyeing.

Mr. Metalka: On silk fabric, we have occasionally had this trouble; in dyeing it, the warp dyes an entirely different shade than the filling.

Have you ever had that experience or have you ever had that defect, and can you tell me how to overcome that?

Mr. Huber: Was the fabric solid silk?

Mr. Metalka: Solid silk material.

Mr. Huber: And all the warps showed different?

Mr. Metalka: Yes. There was a different twist to the warp than the filling. We have never had that before, even though we have had similar cloth. This is the first time we have ever encountered anything as bad as that.

Mr. Huber: I do not believe your trouble is due to the use of different kinds of raw silk. Many times a yellow silk is used for the warp and a white silk for the filling, which boil off sufficiently white except for very extremely light shades.

Was this a fairly dark shade?

Mr. Metalka: All shades. It seems to be particularly applicable in the case of brown.

Mr. Huber: I remember at one plant where they produced a heavy hard twisted crepe they had trouble in getting the boiled-off silk white enough to dye the light greens, blues and yellows, but the dark shades came out all right.

Mr. Metalka: It seems to me that it isn't a question of boiling off, because we have never had that experience before. We have had the same type of silk in before but we did not have any trouble with it. But on one occasion that I know of we seemed to get a fluorescent effect because the warp and the filling dyed differently, although they were all-silk materials. The only difference that is noticed is that the warp has a higher twist than the filling.

Mr. Huber: This is one of those cases that I mentioned. Unless you can get all the facts and historical background; unless there are available separate warp threads, filling

threads, undyed and dyed fabric, the case is almost hopeless.

Chairman Baxter: I would like to ask what test you make, in handling velvets which are anti-crease finished, or any other fabric with that finish, for the odor which has sometimes given one or two headaches.

Mr. Huber: When it comes to odor, of course, it depends on the type. Some of them that are due to a fairly heavy distillate may be determined by making extraction tests. But the detection of odor by the sense of smell is such a delicate thing that it can not be measured by the finest micro-balance. Your sense of smell is so delicate that you can actually determine the presence of material that you cannot possibly measure by any scientific means at the present time.

Chairman Baxter: I didn't mean exactly that. I mean what type of test do you apply for an odor which might crop up later on, not something which would have an apparent odor at the time the goods were given to you for testing.

Mr. Zisman: I think what Mr. Baxter has reference to involves the question of exposure—oxidation. Some things don't have an odor today but three weeks from now they may have.

Mr. Huber: Most of that I think comes out more definitely with a steam test—pressing and steaming.

Mr. Brosnan: I think I can offer another answer to that question.

Another way of testing it is to put it in a Fade-Ometer for forty-eight hours, with moisture content there. I mean the regular modern Fade-Ometer. Forty-eight hours in that will pretty well tell you whether it is going to go rancid or break down, if you get an odor out of it.

MEETING, NORTHERN NEW ENGLAND SECTION

A MEETING of the Northern New England Section was held at the Walker Memorial, Massachusetts Institute of Technology, Cambridge, Mass., on Friday, January 14, 1938, with eighty-seven members attending the dinner and the meeting which followed.

Professor J. H. Skinkle of the Lowell Textile Institute gave a talk entitled, "Simplicity in Textile Testing." Professor Skinkle called attention to the expense of equipment, complexity and lack of co-ordination in several of the standard tests as exist in the present year book of the A. A. T. C. C. He emphasized the necessity of translating these tests to more simple procedures involving much less equipment and personnel which could be afforded by the small textile plant and would be quite satisfactory for plant control.

Dr. Wanda K. Farr of the Boyce Thompson Research Institute presented a lecture entitled, "The Chemistry of Cellulose." Dr. Farr interested everyone present with her fine presentation. Her talk was amply illustrated with lantern slides of photomicrographs which showed her splendid technique in proving the existence of cellulose particles within the plant cell, fibril formation and orientation along the wall of the plant cell. Dr. Farr's talk was one of the best this section has been privileged to hear.

Respectfully submitted,

JOHN N. DALTON, *Secretary*.

MEETING, NORTHERN NEW ENGLAND SECTION

A MEETING of the Northern New England Section was held at the University Club, Boston, on Friday, March 4, 1938, with fifty members attending the dinner and about sixty attending the meeting which followed. The speakers included past presidents of the A. A. T. C. C.

Dr. L. A. Olney, President Emeritus, presented some comments on the research activities of our organization.

Mr. William H. Cady presented two papers, one entitled "The Tendering Action of Light on Textile Fibers" which was an account of the present knowledge and the possibilities of future research in this subject. Mr. Cady also gave a paper entitled "The Future of Our Organization."

Mr. P. J. Wood, of the Royce Chemical Company, presented the paper, "The Preparation, Printing and Finishing of Rayon."

The meeting was thoroughly enjoyed by those present.

Respectfully submitted,

JOHN N. DALTON, *Secretary*.

REPORT, NORTH CAROLINA STATE COLLEGE STUDENT SECTION

THE Section has been fortunate in having a number of prominent men in the dyeing and finishing industry as speakers during the last month. Among these were:

Mr. Ben Verity of Carbic Color and Chemical Company. Mr. Verity spoke on his company's line of Indigosol colors.

Mr. George W. Searell of Jacques Wolf & Company spoke on some of his company's products, mainly gums, oils and hydrosulfites, their uses and advantages.

A very interesting demonstration on pH determinations was given by Mr. "Pat" Gaskins of Phipps & Bird, Inc. Mr. Gaskins is selling Coleman Electrometers. This is an instrument to determine pH electrically.

Mr. Marcus Haney of the Fine Chemicals Division of E. I. du Pont de Nemours & Company talked on some of the specialty products of his company.

Mr. W. S. Simms, Technical Demonstrator for Geigy Company, and Mr. Jack Schandler of the same company gave a talk and answered questions on "Fluorescent or Iridescent Shades on Hosiery."

All of these talks were most interesting and instructive and we appreciate the time and interest of all these men.

J. A. HOLDER, JR., *Secretary*.

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CHEMISTS, RESEARCH AND PATENTS

IN the March 20th News Edition of *Industrial & Engineering Chemistry,* publication of the American Chemical Society, attention is called by the Secretary of the Society to the Bill, H.R. 9259, "To Provide for Compulsory Licensing of Patents." In brief the bill would give to the inventor exclusive rights to maintain and use the invention and discovery for only the first three years, compared to such exclusive rights at present for 17 years. After three years licenses would be obtainable upon application to the Commissioner of Patents and at his volition. Attention is drawn to the fact that 9 out of 10 members of the Society working in private laboratories, in college laboratories, research organizations and in the chemical plants of the country have hopes of some day making a discovery or invention from which they will secure a return. Such a bill as the one proposed would destroy this hope inasmuch as it would not profit one to take out a patent if at the end of three years anyone could secure a compulsory license. Further it would make the patent worthless as far as sale is concerned inasmuch as capital would not invest in patents if competitors can secure the results at no greater cost than that of royalties. Attention is also drawn to the fact that millions are spent annually on research by our large chemical corporations, and if the bill were passed it would throw thousands of chemists out of work for no individual, corporation or industry could afford to put money into the development of patents which would be open to competitors in 3 years.

On March 25th the secretary of the Society appeared before the committee holding hearing on the bill and filed a statement which had been prepared by the president of the society. The points which were made are summarized in the April 10th News Edition as follows:

"1. The bill would seriously retard research and progress.

"2. It would encourage secret processes rather than patents.

"3. It would suppress publication of new knowledge.

"4. The only monopoly it would destroy is the natural limited beneficent monopoly which the patent system is intended to foster and which has been potent in our country's progress and development.

"5. It would injure the small investor and small business far more than big business by taking from them their chief protection, which the exclusive right for 17 years of opportunity for development now gives.

"6. We are in the midst of a most sudden and extreme depression caused by the brakes put upon business and the uncertainties of the fog in which all business is today forced to navigate. No blow to which the chemical process industries has been subject will have such serious effect as the proposed compulsory licensing of patents. It will increase unemployment by throwing numerous laborers and thousands of chemists out of employment and will further most seriously retard a business now paying one-fifth of the federal taxes.

"7. It will increase prices to the consumer.

"8. It will magnify uncertainty and will discourage investment in new discoveries.

"9. It will serve no good purpose".

It appears to us that the ninth point enumerated above should be enough to prevent or discourage the passage of such a bill. The value of the patent system and the logical use for which it is intended would be destroyed if such a short term as 3 years for exclusive rights were adopted. The only alternative would be for the inventor to keep secret the uses of a patent which would prevent disclosure of the contents of the invention and further prevent it from becoming public property at the end of the present term of 17 years. The public would have to pay the manufacturer whatever price he chose to set for the invention being held in secret as competition would be lacking. While the bill has been proposed by those who think it will help to control big business and monopolies they would be far less injured than the chemist-inventor who develops the patent and has the patent right to sell. No individual or company would be interested in furnishing money necessary to the full development of the uses of the patent. The bill would certainly stifle research in any company engaging in it.

What is true for the chemical industry would likewise be true in regard to inventions and patents in other industries. There apparently is no logical reason for the passage of such a bill and no good point would be served by its enactment into law. It looks as if the bill would die a natural death, but it should under no circumstances be allowed to be passed.

WASHINGTON NEWS LETTER

WALDON FAWCETT

THE termination of the clogging filibuster in the U. S. Senate was welcomed by the forces of science and industry because it improved, by so much, the chances of a number of miscellaneous bills. Observers of the scene at Washington well understand that it is only in the later reaches of a Congressional session that there is the remotest chance of enactment of the measures contributory to the causes of research and commerce. So long as the annual appropriation bills for the various Departments have the floor, and so long as major issues of "must" legislation are undisposed of, there remain in abeyance virtually all versions of special and constructive legislation. Even the Hearings in Committee, which are the inevitable prelude of favorable reports and recommendations, are difficult of arrangement until the Congressional slate has been cleared of supply bills and administrative programs that afford ammunition for an impending political campaign.

THE WEIGHTS AND MEASURES BILL

Perhaps not all parties at interest have sensed the significance of the pending Bill to fix the standards of our system of customary weights and measures. This Bill originated with the Department of Commerce, was approved by the Bureau of the Budget; and has been favorably reported by the Committee on Coinage, Weights and Measures of the House of Representatives. The purpose is to remedy the oversight which has left the inch and the pound without legal definition. Proponents feel that it is extremely desirable that there be definite relationship between the units of the metric system and the corresponding units of our customary weights and measures. This objective the pending Bill would attain by authoritative definition. For example, by defining the inch as a specified fraction of the meter.

The ratio proposed for reconciliation of the two systems of measurement is one that is widely used. Indeed, has been officially recommended by the standardizing agencies of some seventeen different nations including both Great Britain and the United States. It differs minutely from the present inch of Great Britain and the present inch of the United States, being intermediate between the two. Specifically, by the value proposed, one inch equals 25.4 millimeters. The change from the present standard would, presumably, be too small to have any effect on industrial measurements. Nevertheless, for the sake of the purposes of international trade it is desirable that U. S. standards be minutely reconciled to the metric system which is now employed by all the countries of the world except Great Britain and the United States. It is hoped that equivalent action on the part of Great Britain would follow approval of the Bill at Washington.

RESEARCH AND DEVELOPMENT PROGRAM

In asking Congress to appropriate about $48,000 to carry on, during the fiscal year 1939, the project on organic and fibrous materials, Director Lyman J. Briggs of the National Bureau of Standards cited the more pressing problems. He pointed out, for example, that when oxidizing agents attack cellulose in the presence of water, producing oxycellulose there is a profound modification of the properties of the material. But knowledge of the final products is lacking and the rate of reaction is unknown. Explaining to his lay hearers that turbid or colored solutions cannot be examined by customary methods to determine degree of acidity or alkalinity, the Director emphasized the importance of the development of standards for hydrogen—ion concentration.

Dr. Briggs took occasion, when he appeared as witness, to stress the significance, for the creation of new industries, of a Bill which has been referred to the House of Representatives Committee on Interstate and Foreign Commerce. The sanctioned Bill would authorize the prosecution of basic research in physics and chemistry by the National Bureau of Standards in cooperation with leading universities and colleges. Support in Congress for this expansion of research is sought on the theory that in the long run the enlarged explorative program would bring rich returns in the employment that would be provided in the new industries created by the discoveries of the research workers. Director Briggs seized the opportunity, when this subject was under discussion in the Congressional subcommittee, to sketch in some detail the connection between research and the development of consumer's specifications, for which there is, just now, increased agitation by consumer organizations. The head of the Standards organization insisted that "the first thing to do" is to determine the essential qualities of fabrics, apparel and the other products regarding which ultimate consumers are most curious. He advocated concentration upon essential qualities as being "the particular things the consumer wants in a product."

SURVEY OF CERTIFIED COLORS

The special subcommittee of the Contact Committee has been seeking more detailed and more explicit information with respect to the pharmaceutical use of certified colors. At the time of the appointment of this Committee the request was circulated that each laboratory interested should supply brief information as to the names and the total number of dyes which were being used. Also sought was information that would disclose the relative importance of the dyes. Without, however, asking statistics of consumption in the event that contributors did not care to reveal the exact quantities used.

The Committee desired a background picture of dye demand—and the apportionment of that demand—in order to be in a position to approach the manufacturers of synthetic coaltar dyes with requests for cooperation in projects such as the proposed simplification of coaltar dyes used in the pharmaceutical industry. Simplification of nomencla-

ture is, of course, the real objective. Information has reached the drug manufacturers that a chemical substance (appropriately recognized as a certified dye) is being supplied under a variety of names. Also, the hint that combinations, now marketed under special trade names are, in certain instances, combinations of dyes already recognized as certified food colors.

While full conclusions are for the future in this study of certified colors, interest has been quickened by the informal deductions that have already resulted. For example, the investigation, to date, indicates that there will be need for additional dyes,—over and above the food colors,—for use in drugs and cosmetics.

Dye manufacturers from the outset indicated a willingness to cooperate. And have intimated a willingness to take steps to add the oil soluble colors which, at this stage, seems to be the most urgent need. At the same time, producers have pointed out that several years of work precede the entry of a certified color to the permitted list. The manufacturer may have to devote two years to investigation, followed by toxicological and pharmacological tests, all of which entails considerable expense. It has been pointed out, too, that, whereas all manufacturers are willing to undertake the dye investigations, not all producers are equipped to make the toxicological and pharmacological tests.

The future course of investigational activity on behalf of the drug manufacturers is of the more moment to the dyestuffs industry because it ties up with the problem of developing new certified colors. With due regard, necessarily, for practical considerations, manufacturers have not felt an impulse to add new colors close to existing certified colors which are consumed in comparatively insignificant quantities.

PROTECTION OF COLOR CARDS AND LABELS

An unsuspected contact for the dyestuffs community exists in a bill to revise administrative arrangements at Washington that may ultimately be embraced within an approved plan for reorganization of the Government Departments. The unobtrusive bill is S.478, a bill introduced by Senator McAdoo, Chairman of the Senate Committee on Patents. The purpose is to discontinue the registration of "prints and labels" in the Patent Office and vest in the Register of Copyrights this form of certification.

The present dual system for the entry of priority claims covering labels, advertising prints, etc., has, over a period of years caused more or less confusion. Together with delays or loss of time, susceptible of serious consequences to parties desirous of establishing property rights in media such as colored covers, color cards, specification- and formula-tags, etc. Under the law now in force prints, labels, etc., designed for use in connection with conventional articles of manufacture may be registered at the Patent Office. On the other hand, engravings, cuts, prints, etc., in the form of pictorial illustrations or works connected with the fine arts are entered at the U. S. Copyright Offices, a branch of the Library of Congress.

Not infrequently, in border line cases, questions have been raised as to what constitutes, for prints and labels, a commercial use directly connected with articles of manufacture. Particularly in the case of representations of color is it possible of demonstration that a given subject has both an artistic status and a commercial status. The bill in Congress proposes to minimize the inconveniences of the double standard of copyright by consolidating in one place the machinery of official certification. It is claimed that prints now routed to the Patent Office could be cleared more quickly at the Copyright Office.

DETAIL FIGURES ON CHEMICAL EXPORTS

Members of the chemical industries are among those who have protested to Washington against the proposal to curtail customs statistics. The issue was joined when it was proposed to make a cut of $33,000 in the appropriation for this branch of the commerce statistical service. That would necessitate the elimination of a considerable number of export and import classes. There would be a corresponding increase in the so-called "basket" classes. That is to say, where various groups of products are lumped. In the opinion of some of those who have protested, this threat to the present plan of breaking down customs statistics is particularly serious at this juncture since it might result in a loss of just that detail information most important in connection with the program of reciprocal trade-agreements now emerging. When faced by the appropriations cut, which would necessitate the dropping of twenty statisticians, the heads of the service took the position that it would be better to considerably reduce the number of items separately reported rather than to delay the issuance of the compilations. Just here, as it happens, the curtailment threatened the latest pride of the customs reporting service. In days gone by, an average interval of 32 days was required to compile the customs statistics assembled by a staff of 147 men in New York and 43 in Washington. Latterly, stung by the impatience of business men who use the statistics, the organization has been whittling down the elapsed time until it was brought to 20 days. This quickened schedule it is desired to maintain, even if the statistics, as published, are less specific than in the past.

THE OUTLOOK FOR DESIGN LEGISLATION

The outlook is not encouraging for legislation at this session to provide better protection for creative designs and original color plants. The situation in the House of Representatives Committee which has jurisdiction has long been regarded as hopeless by proponents of a new and improved system of design protection. Something of the same pessimism appears in the Senate. A typical expression by a confirmed advocate of reform was voiced by Senator Arthur H. Vandenberg of Michigan. He said: "I know of no immediate plan to resurrect the Design Copyright Bill. It is so utterly controversial that I have come to doubt whether it will ever be possible to make legislative headway in this direction, although I continue greatly to believe in the need to stop design piracy."

Textile Tests on Knit Goods

JOHN H. SKINKLE*

THE following is a description, or rather listing, of the tests which may be carried out on a specimen of knit goods for the purpose of obtaining the general quality, closeness to specification, or for the reproduction of the fabric. In any particular case, all of the tests will probably not be necessary, but selected tests may be carried out according to the specific requirements. The knit goods field has been divided into three groups: A. Knit fabric, either split or tubular; B. Knit garments, usually made from the preceding fabric but which now have definite shapes; C. Hosiery, a very specialized form of knit garment which deserves special attention.

1. Type of sample.

If a fabric, state whether split or tubular; if a garment, give the name and wearer, e.g., men's undershirt; if hosiery give wearer, length of sample, and method of manufacture (full-fashioned, circular, cut), e.g., women's three-quarter hose, full-fashioned.

2. Stitch used.

The ordinary stitches may be easily recognized after a little experience (plain, rib, etc.), but fancy stitches should be referred to an expert. In general, fabrics and garments will be all one stitch but hosiery may have several types of stitch present in different parts of the hose.

3. Size.

If a fabric is examined, give the width. If a garment is examined, make accurate measurements and determine the size by consulting tables. If hosiery is examined, the size is determined by the length of the foot but other measurements, especially of length, should also be made.

4. Wales and courses per inch.

These are determined with a pick glass or on a coarse stitch by a rule and needle. Wales are counted for an inch along one course and courses are counted for an inch along one wale. Five or more counts are made on each, at different spots, and averaged.

5. Total needles used.

This may be determined most accurately by actually counting the number of wales in the circumference. As a close enough approximation for ordinary purposes, the total needles is the number of wales per inch times the width.

6. Weight.

In the case of a fabric the weight per square yard is given, determined by cutting out a number of pieces of known area and weighing. In the case of knit garments the weight per dozen garments is obtained by weighing as many garments as are available and computing the weight per dozen. In the case of hosiery, the weight per dozen pair may be given; a more popular practice in women's hose is to give the number of threads of 13/15 silk used (determined in test 8, following).

7. Bursting strength.

This is determined for fabrics only; except in unusual cases involving a claim of tendering it is not determined for garments or hosiery. The ball burst or the hydraulic burst may be used.

8. Counts or denier and number of plies or filaments in the yarn.

This is determined by unraveling the yarn and winding a skein on a yarn reel. The weight and length of the skein will give the counts or denier, and the number of plies or filaments may be counted. If the sample is silk hosiery, the number of threads of 13/15 silk should be computed.

9. Stitches per foot of yarn.

This is determined only on fabrics and garments; it is done by unraveling a counted number of stitches and measuring the length of yarn obtained. Calculation then gives the stitches per foot of yarn.

10. Oil and grease.

This is of interest primarily to the dyer and finisher who must contend with it before dyeing. Finished goods, unless stock-dyed, do not usually contain oil or grease. If it is determined, an extraction apparatus of the Soxhlet type may be used or the apparatus specified by the A.S.T.M. Carbon tetrachloride is used as the solvent.

11. Weighting.

This was once a serious problem on silk goods but of recent years the tendency has been to make lighter goods rather than heavier, so that the determination of weighting is not important in knit goods. Mineral weighting may be determined by ashing the sample or by removing the weighting with hydrochloric acid-hydrofluoric acid mixture according to the procedure of the A.A.T.C.C. Cotton and woolen goods, of course, are seldom if ever weighted.

12. Dye used.

The dye used on the sample may be tested by the regular procedures for the type of dye (acid, basic, direct, vat, etc.); the fastness of the dye may also be determined by exposure to sunlight or to the Fade-Ometer, using the standard procedures of the A.A.T.C.C. The fastness to laundering may also be determined.

13. Fibers present.

These may be determined qualitatively by chemical tests or by the use of the microscope. If a quantitative analysis is desired, the standard procedures of the A.A.T.C.C. or the A.S.T.M. should be followed.

*Lowell Textile Institute, Lowell, Mass.

Some Notes on

Hosiery Dyeing

With Special Reference to Cupro-Viscose Goods

F. S. BEATTIE*

IT is a far cry from the first silk stockings, made and presented to Queen Elizabeth of Great Britain as a valuable gift some hundreds of years ago, to the modern artificial silk knitted hosiery now expected for even ordinary wear by the women of today. An historical museum would prize highly a collection of specimens of women's hosiery, including well-preserved examples of the first silk hose, cut from silk fabric and painfully sewed to approximate shape by hand, by the fine and painful needlework of our ancestors; and containing material representative of each succeeding slight improvement made by the industry, together with the defects, as they would appear now, which were characteristic of each stage of development of the product. Stockings cut from fabrics and hand-sewed—fabrics of every imaginable type of weave, every conceivable type of stitch, the gradual mastery of the problem of seams, patient efforts to overcome troubles in dyeing with the primitive vegetable dyestuffs and stains which passed for dyestuffs, the gradual replacement of woven stock by piece-knitted goods, the gradual overcoming of the problem of ridgy seams, knots, etc., the methods of saving costly material by the use of cheaper material for the parts to remain unseen when worn, the first specimens made from the earlier artificial fibers, with their new defects in seam, welt, foot, and defects originating in the tenderness and fragility of the new fibers, and culminating in the modern product, perfectly knit and shaped, resistant to fair wear, and perfectly dyed in tints of which our forefathers were ignorant—such an exhibit in a modern museum would prove, to womankind, and to thoughtful textile workers, a fascinating section, to be visited and revisited often for study and reflection. But such a collection can now never be formed.

For some years past the trend abroad has been toward the use of the artificial fibers for the knitting of hose. The reason for this lies, perhaps, first, in the much lower cost and much more abundant source of supply of the artificial fiber, as compared to that of natural silk; but other important factors have also been involved. Natural silk, while in one sense a substance of homogeneous nature, is not of such a nature in the stricter sense. A lot of natural silk is a blend (and a blend not always thoroughly blended) of silks originating from different cocoons, produced from different silkworms, whose life-process, the same in general, is unavoidably distinct in detail. A year's lot of natural silk includes the product of many races of silkworm, carrying out their life-activities in different parts of the country of origin, and unavoidably influenced to some extent by life-conditions (climatic, topographical, and meteorological conditions, degree of care and oversight by the growers, variations in food-quality, etc.); and, consequently, there will be unavoidable differences in the physical, and to some extent in the chemical, nature of the fiber. The titer will vary; the luster will vary; the color, also variable, may be reduced to apparent uniformity in the various stages of preparation of the fiber, but such treatments will unavoidably bring about or accentuate minute but detectible differences in the affinity of the fiber for dyestuffs here and there in a given lot, except in cases of fairly deep dyeings with certain dyestuffs. The modern cases of dyeing in the lighter mode-tones most frequently bring such non-uniformity of affinity for dyestuffs literally to the light. Now, with the artificial fibers, it has become possible, by advances in manufacturing methods, to produce a fiber which will be absolutely uniform in its properties, throughout the whole lot, and through lot after lot—in its titer, luster, color, and all other physical properties; and this fact is perhaps nowadays the most significant of all; for, when a given sequence of standardized processes has been worked out for such a fiber, the industry is able to propose a certain desirable result to be attained, and to expect with confidence that the product will fulfill the specifications.

During recent years, some manufacturers of cupro-rayon have succeeded in producing a fiber of unsurpassed fineness. One such product is a yarn of 25 den., which is an extremely close approach to a natural silk yarn containing 25 fibers. The product, besides its practically unequalled fineness, and the additional value of its practically absolute uniformity in every way, possesses the delicacy of the natural silk yarn corresponding to it, an excellent luster, scroop (this term, appropriated strictly to natural silk only, must now be allowed to apply as well to such rayons as we are considering), elasticity, and wearing properties. Another product of the same nature is a yarn of 12.5 den., containing 25 fibers, this achievement surpassing the utmost efforts, so to say, of the silkworm itself, as far as fineness of fiber is concerned. It may be considered, then, that the producers of the artificial fiber, as far as we are considering cupro-rayon, at least, have done almost all that could reasonably be asked of them; and the next part of the task devolves upon the knitter, the dyer, and the finisher; upon the dyer principally, who must take care that his part of the task shall not only be performed

*Lowell Textile Institute.

adequately, but also that the processes which he carries out shall not introduce any difficulties in the way of weakening or tendering the fiber, generally or locally, so as to undo the work of the knitter, and which shall not make difficult or nullify in any way the final work of finishing the goods.

Cupro-rayon, owing to the peculiarities inherent in its method of manufacture, displays a special sort of affinity for almost any class of dyestuffs, to some extent, but, most naturally, toward the substantive dyestuffs. It also displays a strong affinity toward almost all accessory materials, as fats, oils, lustering agents, finishing agents, and wetting-out and emulsifying agents. In the use of such assistants, special attention, of course, should be directed to possible modification, by some of them, of properties of the fiber which are to be carefully preserved unchanged; and, above all, with such high-grade yarns as have been mentioned above, the fineness and consequent delicacy of the fiber demands special care. The question of the use of assistants, etc., which will accomplish their own proper work and at the same time will exert a protective influence upon the delicate fiber, is obviously an important one. And, this applies, also, to the mechanical equipment; all surfaces of containers, handlers, transmissions, etc., must be absolutely smooth, to avoid the risk of catching and breaking of the fiber, or of abrasion of the yarn with its weakening and final breaking as a consequence.

As to the dyeing, it is evident that, for such special articles as hose, and particularly women's hose, which must, being perfectly knitted to shape, come through unaltered, certain commonsense precautions should be taken, in the way of pretreatment or preparation for the dyeing. The principal troubles met with are non-level dyeings, whether generally unlevel, streaky, or spotty; poor matching of tone or depth in the different parts of the hose, in body, foot, welt, seams, or special weave-effects; incomplete dyeing through of the thicker or more compacted portions, as the seams or any sewed portions; and bleeding into or tinting, or overdyeing or underdyeing of special portions consisting of fibers of other nature, such as are to remain undyed, as acetate-rayon or immunized cotton effects. Some of these troubles originate in the dyeing process itself; non-level dyeings may be due to imperfect cleansing of the goods before dyeing. This pretreatment is absolutely necessary before one can even hope for level tones.

The usual cleansing, in a bath containing 3-5 g. of soap and about 1 g. of soda-ash per liter, and also a small amount, say 2-5 g., of some good fat-solvent, many of which, of excellent quality, are on the market, will be sufficient. As is generally customary, care must be taken to introduce the goods in such a way that the bath may penetrate them quickly and evenly, and that any mechanical strain upon them may not be possible. The usual method, that of threading one or two pairs together loosely by the tips, and hanging each lot thus formed upon poles crossing the bath, so that the hose hang free, and still at a reasonably short distance apart, without wasting space, will avoid any trouble from too close packing and imperfect circulation of the bath. From one to two hours' boil in the above bath will bring about proper cleansing, although, if the goods are introduced into the bath in the afternoon, at a bath-temperature of about 40°-50° C., and allowed to stand, the bath cooling off, over night, followed by the 1-2 hours' boil at the next morning, the results may be considered perfect. If the goods are very dirty or oily, it may be well to follow this bath by a second one similar to the first, for the same period of time, though such a condition might well be brought to the attention of the knitter. Also, in case of goods containing acetate-rayon effects, it will be safer to omit the soda, and possibly the soap also, from the bath, and to depend upon non-alkaline detergents and fat-solvents. Goods of Celta yarn will require special care in the first wetting-out, if the characteristic properties of that fiber are to be preserved unimpaired, as the fiber is very sensitive to aqueous baths.

Bleaching is a matter which does not always require attention—none, if any cotton present has already been bleached. If unbleached cotton has been used for foot or welt, and light tones are to bed yed, then bleaching will be necessary, if the tones are to match; and in such a case ordinary bleaching with a bath of sodium hypochlorite containing 1—1.5 g. of active chlorine per liter will be sufficient—this after the above scouring. Some workers find it advantageous to add a little of one of the modern wetting-out agents to the bath, though there is a difference of opinion as to whether this is necessary. Hypochlorite seems at present to be more in favor than peroxide. After bleaching, if this is carried out, comes the usual souring, and careful washing until the goods are completely free from acid.

As to the dyeing itself, since the goods consist of regenerated cellulose, the conditions customary for such material of course hold good. The articles are introduced into the boiling dyebath, and dyed as usual, the bath containing, beside the dyestuff, perhaps 1—3 g. of soap per liter, and, again, if desired, a little of some one of the modern approved wetting-out agents. If dyeing to sample, it is well to enter the goods into the boiling bath without the dyestuff (i.e., the bath containing only the assistants) and to add the dyestuff, carefully dissolved, in small portions, the goods being thrown up while the dye solution is being added, to avoid uneven dyeing. If Glauber's salt is used as an assistant, it is best to reserve the addition of this until dyeing has progressed so far that the seams are dyed through, through for light tones to middle tones no assistant should be necessary. If any acetate rayon effects are present in the lot, then, as before, one must proceed without any soap, unless one of the mildest sort, to avoid trouble with potential alkalinity, for fear of its saponifying effect and consequent alteration of the luster of the acetate fiber, as well as alteration of its affinity for the dyestuffs which are being used. In such a case, the wetting-out agent will be absolutely necessary. And, if the acetate rayon component is also to be dyed, the appropriate dyestuff for it may be added, as above, to the

dyebath, both kinds of fiber being dyed simultaneously. Any components of immunized cotton will not need any of the above precautions, this kind of fiber being too resistant to the action of anything but an unreasonable concentration of alkali.

It is best to consider the process as a strictly hand-dyeing problem, and to give it the utmost individual care, on account of the critical standards which such goods must be able to satisfy. There is very little in the way of suitable apparatus for machine dyeing of these goods which will not prove vexatious and uncertain; and such apparatus as approaches hand-dyeing in its arrangement and mode of operation will prove most satisfactory. But what is practically piece-dyeing by hand will produce results with the least amount of worry, and the most certainty.

For scrooping the dyed goods, considering the nature of the fiber, all that is needed is treatment with some agent which will impart a desirable softness and flexibility to the goods; the luster inherent in the fiber will be persistent, if the dyeing has been properly carried out. For, as the material is a regenerated cellulose, to which has been imparted the desired luster, in the actual manufacture of the fiber, and since, by correct methods of scouring and dyeing, this luster should not have become altered in any way, the goods should appear to the eye as they are to be. But treatment of the goods at this point with a sulfonated oil, or with one of the modern substitutes for such oils, will impart a greater smoothness and softness and flexibility to the goods, and this may perhaps be considered necessary. The addition of a little glycerine to the bath yields effects still more desirable in most cases. On the other hand, if a silk-like scroop is desired, this may be attained by addition of a little lactic acid to the bath. And it is best to employ the bath in any case after the goods have left the dyebath and have been alloweed to drain or have been centrifuged, but without their having been allowed to begin drying out, since the fiber at this point is still in its optimum swollen and sensitive, or, perhaps we might better call it, its most responsive, condition.

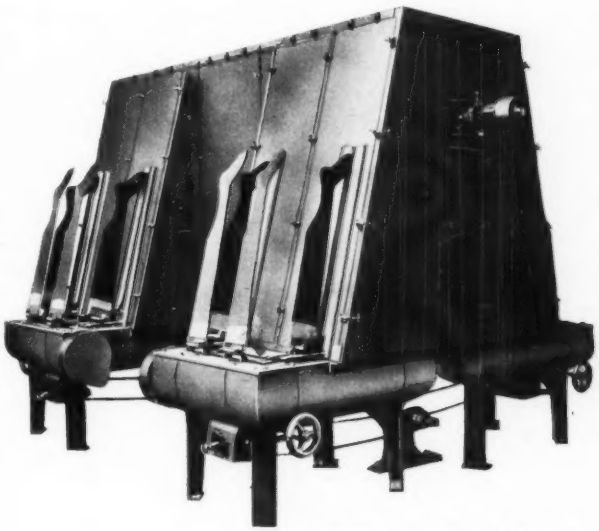
All that has been mentioned above is equally applicable to knitted goods of other sorts than those, of the same fiber.

The preceding has had reference in particular to the most modern cupro-rayon hose of the latest fineness of fiber, since such material presents general problems in the most pressing manner, and any results less than perfect mean further vexation and uncertainty in stripping and redyeing, for only perfect results will be accepted by the dealer and consumer. With goods manufactured from rayons of less fineness of fiber, less anxiety will need to be exercised.

As to the dyestuff themselves which are most suitable, there is of course an uncommonly large number of direct cotton dyestuffs, of what may be generally called the diamine type. Many of such dyestuffs will prove suitable for various tones, in tone itself and in fastness-properties; the dyer experienced in the dyeing of cotton should have no difficulty in drawing upon his experience with that fundamental fiber. In case of goods containing immunized cotton or acetate rayon, which are to be left uncolored, there are still many dyestuffs regarding which the manufacturers will give full information in special points. In fact, in the whole range of operations here discussed, there are really no special problems or dangers involved at all; the attitude to be maintained is only "definite results required, delicate material to be dealt with, judgment and care to be exercised."

Hosiery Machinery

(Continued from page 204)



Courtesy of Proctor & Schwartz, Inc.

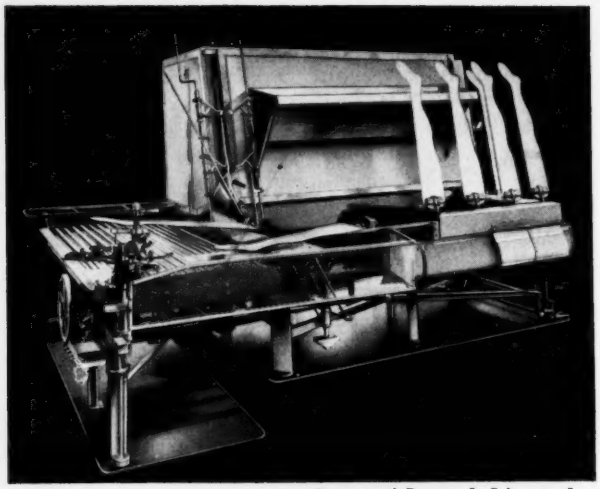
Fig. 6—First Automatic Boarding Machine.

AUTOMATIC BOARDING EQUIPMENT

One of the earliest types of automatic boarding equipment is shown in Figure 6. The boarder at this machine stands in one spot while the forms move. The hose are dried by a current of warm air. The stocking is still stripped by hand but production speed is increased as it is unnecessary for the boarder to move around a set of forms or from table to dry box. Gradual improvement brought the machine pictured in Fig. 7.

This machine requires no further work by the boarder than that of shaping the stockings on the form. The hose are carried through the rear chamber, dried by warm air, stripped, piled and counted without further attention by the worker. The automatic stripper, shown where the stocking leaves the drying chamber is one of the latest improvements.

Another type of automatic boarder also makes walking unnecessary. The forms, instead of being spread out over



Courtesy of Proctor & Schwartz, Inc.

Fig. 7—Last Word in Proctor & Schwartz Company Boarding Equipment.

a large section of floor space, are mounted closely together, and can be moved forward by motor power so that the hose can be easily boarded and stripped. The forms are of stainless metal, "bellied", and steam heated. A convenient table, to hold a few dozen of wet work, is equipped with a stainless metal top for the finished hose.

With any of the modern automatic pressing machines, greatly increased production is possible over that of any of the older types, and quality has kept pace with increase in quantity.

CONCLUSION

The Knitting Arts Exhibition which opens at Philadelphia this month will bring to one center all of the latest machinery and accessories, in use or proposed for use, in the hosiery industry. What strides have been made in this industry since Queen Elizabeth refused William Lee a patent for his first knitting machine! Because of this advance, it is possible that the poorest girl in Philadelphia is wearing a finer pair of stockings today than good Queen Bess ever saw.

ACKNOWLEDGMENTS

The author wants to extend his thanks to Smith Drum & Company for their kind cooperation in supplying photographs for Figures 2 and 3; to Paramount Textile Machinery Company for photograph for Figure 5 and to Proctor & Schwartz Inc. for photographs for Figures 6 and 7.

TRADE NOTES • NEW PRODUCTS

• CYANAMID BUYS AMALGAMATED AND CAMPBELL

THE Calco Chemical Company, Inc., of Bound Brook, N. J., has announced that on March 31, 1938 the American Cyanamid Company acquired the assets of The Amalgamated Dyestuff & Chemical Works, Inc., of Newark, N. J., and at the same time also acquired the business of John Campbell and Company, 75 Hudson Street, New York City.

The Amalgamated Dyestuff plant will become a manufacturing division of Calco and will continue to make Sulfur Colors, Azo Colors, and certain other textile products in which they have specialized for many years. This concern pioneered in the manufacture of Acetate Colors of which it now produces an exceptionally complete line. This department will be expanded as rapidly as possible under Calco's research direction.

John Campbell and Company, established in 1876, maintains branch offices in Philadelphia, Boston, Providence and Chicago, as well as warehouses at Concord and Burlington, N. C. A new corporation has been formed under the name of John Campbell and Company, Inc., which will take over all the assets and business of the former concern.

• CIBA REVIEW

Copies of *Ciba Review*, Number 7, featuring the color scarlet, have recently been distributed. Listed in the contents are the following titles: Scarlet:—Kermes, Cochineal; Modern Scarlet Dyes; Cornelius Drebbel and English Scarlet Dyeing; Historical Gleanings; Scientific Notes. Also included with this issue is a supplement entitled: "Dyeings with Neolan Blue GG" which shows the color in combination with level dyeing acid colors. For the production of fast mode shades on the better quality of ladies' dress goods, combinations of such colors as Kiton Fast Yellow AE and 3G, Kiton Fast Orange G, Kiton Fast Red BL, Kiton Fast Red 4BL and blues of the acid alizarine series were chiefly used. It is claimed that extensive practical trials have now shown that the acid alizarine blues can be replaced by Neolan Blue GG which is equally level dyeing when applied by the same method as for ordinary acid colors. Copies of *Ciba Review* are available upon request to the Ciba Company, Inc., Greenwich and Morton Sts., New York City.

• SOUTHERN SALES MANAGER

Hugh Puckett has been appointed Southern sales manager of the American Cyanamid & Chemical Corporation with headquarters at the Charlotte office. Mr. Puckett has been acting in the capacity of assistant southern sales manager.

• NATIONAL RELEASES

National Aniline & Chemical Company, Inc., 40 Rector Street, New York City, announces the release of bulletins describing the following products:

National Solantine Brown B R L—a new, fast-to-light direct brown, producing a somewhat more subdued shade than Nation Solantine Brown 4 R. This new dye is said to be particularly valuable because of its excellent light fastness; in addition it is said to possess good fastness to perspiration, sea water, stoving and rubbing and to readily dissolved and level well. Further, it is said to possess excellent affinity for cotton and rayon; on pure or tin-weighted silk somewhat lighter tones are produced. Its excellent light fastness, together with good dischargeability and level dyeing, are said to recommend it for the dyeing of drapery and upholstery materials. Bulletin No. 213.

National Alizarine Sapphire 2 G L—the greenest of National's fast-to-light acid blues. It dissolves easily and dyes very level, yielding pure blue shades said to possess excellent fastness to light, carbonizing, stoving, alkali spotting and rubbing. Its fastness to light and ease of leveling are said to make it particularly suitable, either as a self shade or in combination, for dyeing carpet yarns, ladies' dress goods, automobile fabrics, etc. It is said to possess considerably more affinity for pure silk than the other acid blues of this class. Bulletin No. 214.

National Solantine Grey B L—the most recent addition to the National line of fast-to-light direct dyes, yielding a somewhat bluer shade of grey than National Solantine Grey G L Conc. It is said to

possess considerably more affinity for animal fibers than the latter product. It is claimed that it is easily soluble, levels well and yields shades possessing excellent fastness to rubbing, alkali spotting and stoving, very good fastness to light and good fastness to washing, perspiration, sea water and organic acids. It is said to be easily discharged. Bulletin No. 215.

National Neutral Brown R D—the most recent addition to the National line of acid dyes, which is applied to wool, pure silk or tin-weighted silk in a neutral or weakly acid bath, yielding a rich, coffee-colored shade of brown. It is said to possess excellent fastness to sea water and stoving, very good fastness to washing, acid and alkaline perspiration and good fastness to peroxide bleach and carbonizing. It is claimed to be a valuable product for dyeing silk hosiery by either the one or two-bath method, for yarn dyeing and, as a neutral dyeing acid dye, for unions containing wool or silk. Bulletin No. 216.

● GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street, New York, N. Y., announces release of the following circulars:

Fast Wool Blue E G—a new acid blue, which is said to level well, even from a sulfuric acid bath, and produce on wool, greenish blues of good fastness to light; in fastness to milling, washing, perspiration, water and salt water it is said to come quite close to the Wool Fast Blues. The shade turns only slightly duller in chroming. It is stated that it is of interest to the hat trade, as it is of better fastness to hot water than other level dyeing acid blues generally used. It is said to have good affinity to pure and tin-weighted silk and to dye wool-silk unions a uniform shade. It is stable to Rongalite C and may be used for colored discharges. Circular I.G. 1395.

Solidogen B—a product which is recommended by the manufacturers for improving the fastness to water of direct dyeings. The latest working methods, which were gained from practical experience, are outlined in the circular and interesting comparisons of dyeings without and with Solidogen B aftertreatment, are given as regards their water fastness. Circular I.G. 1423.

● LAUREL RUXITE RO

Laurel Soap Manufacturing Company, Inc., Philadelphia, announces a new soluble rayon coning oil, Laurel Ruxite RO, said to be a superior rayon lubricator which prevents split filaments and breaks; gives greater pliability; emulsifies readily in water; washes out entirely in scouring process; does not discolor on standing; increases winding efficiency.

● HYAMINE A

Rohm & Haas Company, 222 W. Washington Square, Philadelphia, Pa., has developed a new tertiary amine. This amine is substantially non-volatile and since it is amphoteric, forms salts with acids or alkalies. It forms water-soluble salts with inorganic acids and oil-soluble salts with fatty acids, rosins, and naphthenic acids.

The Hyamine soaps are said to be particularly useful in the preparation of emulsions, creams, pastes, and cosmetics. The Hyamine fatty acid soaps are unique in their oil solubility and in their ability to emulsify oil systems. It is claimed that Hyamine A is an excellent solvent for a wide variety of compounds and it is particularly recommended for neutralizing acid and preventing corrosion in oil systems. It is unusually effective as an ingredient in paint removers. It also acts as a stabilizing agent in petroleum oils. As a tertiary amine, it reacts with a wide variety of compounds and is of interest in the synthesis of new disinfectants and pharmaceuticals.

Fatty acid salts of Hyamine A are available. It should be pointed out that this amine and its salts is a new member of the series of organic amines and quarternary ammonium compounds which this company is producing.

● du PONT RELEASE

A new dyestuff which shows only a slight change under artificial light is announced by the Dyestuffs Division, E. I. du Pont de Nemours & Company. Known as "Ponsol" Brown 2G Paste, it produces yellow shades of brown, and may be used alone or in combination for dress-goods, shirtings, curtains and similar materials because of its yellowish shade and its fastness properties. This vat brown is more yellow than Brown AR Paste and brighter than Brown AG Paste. It is stated that it has demonstrated a practical immunity to the majority of ordinary destructive agencies, and good dyeing characteristics, being suitable to cotton and rayon in all forms.

● AWARDED MEDAL

Dr. Sterling Temple, director of the Roessler and Hasslacher Chemical Department of E. I. du Pont de Nemours & Company at Niagara Falls, New York, has received the Jacob F. Schoellkopf Gold Medal of the Western New York Section, American Chemical Society.

The citation mentioned Dr. Temple's "distinguished service through the directorship of chemical research". Eighth winner of the award, he was called a "keen thinker and capable executive."

Dr. Temple was born in Morristown, Minnesota, in 1882. He studied at Hamline University, St. Paul, Harvard University and the University of Minnesota, and later was a member of the faculty of Dakota Weslyan University, Hamline University and the University of Minnesota. He joined R. & H. in 1917. He is a member of the American Chemical Society and the Electro-Chemical Society.

● USES OF METALS

A paper, "Some Uses of Metals in the Chemical Industry" by Mr. F. L. LaQue, was presented March 21, 1938, before the Western Metals Congress, Los Angeles, Calif., by Mr. G. L. Cox.

This paper covered the uses and applications of Aluminum and High Aluminum Alloys, Copper and High Copper Alloys, Nickel and High Nickel Alloys, Precious and Semi-Precious Metals, Stainless Steels, Iron and Steel and Lead and High Lead Alloys in the Chemical Industry.

Mr. LaQue and Mr. Cox are members of the Development and Research Division of The International Nickel Company, Inc.

● S.C.I. MEETING

A meeting of the American Section of the Society of Chemical Industry, jointly with the American Chemical Society, was held on April 8th at The Chemists' Club, 52 East 41st Street, New York City. Mr. James G. Vail was the chairman. The guest speaker was Dr. George W. Morey of the Geophysical Laboratory, Carnegie Institution of Washington, whose subject was "Rock Formation: Nature's Chemical Industry".

● S.O.C.M.A. MEETING

The regular monthly luncheon meeting of the Synthetic Organic Chemical Manufacturers Association of the U. S. was held at the Chemists' Club, New York City, on Wednesday, March 23, 1938. Among the items discussed in the Secretary's report were: trade agreements, drug bill (S. 5), Federal trade commission amendment, free trade zone (Staten Island), import statement No. 2865, and the Doughton Bill (H. R. 8099). It was decided to hold the next general luncheon meeting on Thursday, April 14, 1938.

● SUMMER COURSES, M.I.T.

Announcement is made of two summer courses at Massachusetts, Institute of Technology this summer. They are:

Principles of Textile Analysis—a six weeks' course beginning July 25, 1938. The work will be given in the textile laboratories under the direction of Prof. E. R. Schwarz and will include lectures, demonstrations illustrated by experiments, lantern slides and moving pictures, together with laboratory exercises in physical analysis of textiles, textile microscopy and principles of fabric structure.

Theoretical and Applied Colloid Chemistry and Colloid Physics—a five weeks' course beginning June 13th, 1938. The work will be given in the department of chemical engineering under the direction of Dr. E. A. Hauser and will consist of lectures, round-table discussions and laboratory investigations and is offered to men actively engaged in industry or in research. Guest speakers from various industries, as well as known experts in the field of colloid chemistry and physics, will address the group during the course. Prof. Dr. Wolfgang Ostwald, one of the foremost pioneers in colloid chemistry, and possibly other European authorities will give special lectures, during their visit to the United States to attend the XV. National Colloid Symposium.

• ARIDEX HW

A new type of water repellent designed for use on materials in which both repellency and body are desired is announced by the du Pont Company. Known as "Aridex" HW, it is a special wax-aluminum salt emulsion with a high solids content. It is particularly recommended by the manufacturer for use on heavy cotton goods to give greater weight and a firm hand, and it is also expected to be useful on all types of cotton, linen, rayon and acetate fabrics.

• JOINS ROXALIN

J. R. Siegers, who for sixteen years was connected with the Lyons Piece Dye Works, in charge of novelty finishes under Dr. Ernest Cadgene, especially those involving lacquers and other surface coating materials, and for several years with the Hamilton Print Works, Clifton, N. J., is now connected with the Roxalin Flexible Lacquer Co. of Elizabeth, N. J. as full time consultant on lacquer printing.

Mr. Siegers left the end of March on a special assignment abroad which will take about three months of his time, and upon his return, his services will be available to the lacquer printers. It is believed that his long practical experience in this field and his first hand knowledge of the use of lacquers and surface coating materials in textile printing, coupled with the new products developed by the Roxalin Flexible Lacquer Co. as a result of constant and intensive research, will be of value to the industry.

• HOUGHTON RELEASES

E. F. Houghton & Co., Third, American and Somerset Sts. Philadelphia, Pa., announces the following new products:

Silklubric No. 60—a balanced blend of sulfonated animal and vegetable oils to which has been added a non-oxidizing white mineral oil and a wetting-out agent. It is used for soaking prior to direct knitting. It is claimed that it offers advantages of more surface lubrication, faster wetting-out, more uniformly conditioned tram and cleaner running silk.

Silklubric "C"—differing from No. 60 in that it does not contain any mineral oil.

Silklubric Soaking Powder—a unit product, containing the proper proportions of alkali salt and mildew preventive. Its use makes it necessary to use only two ingredients in the soaking bath: the oil and the powder.

• HAAS-MILLER RELEASE

Haas-Miller Corp., 4th and Bristol Sts., Philadelphia, Pa., announces the perfection of a colorless, self-emulsifying oil. It is stated that it contains no free fatty acid and less than ½ of 1 per cent moisture; further that it is odorless, stainless and non-oxidizing. The product is known as Hamico No. 700.

• BIVANS WITH WARNER

Announcement has been made of the appointment of Kenneth R. Bivans as manager of the Chicago office of the Warner Chemical Co. His appointment was effective as of March 11th. He was formerly with General Chemical Company and Monsanto Chemical Company. Mr. Carr, formerly manager of the Chicago office, has left the company.

• INDUSTRIAL RESEARCH LABORATORIES

The increase in the number of research laboratories maintained by industrial concerns in the United States during the last few years has made it seem desirable to issue a new edition of the National Research Council's Bulletin, "Industrial Research Laboratories of the United States", fifth edition.

On March 25th questionnaires were mailed to the 1562 concerns which were included in the last edition of 1933, and to a large number of new concerns which are thought to maintain laboratories.

If the reader of this is a member of a firm which maintains a laboratory where research looking towards the development and improvement of products is carried on, it is hoped that he will ascertain whether a questionnaire has been received by his company, and if not that he will request one from the Library, National Research Council, 2101 Constitution Avenue, Washington, D. C.

There is no charge for the entry in the bulletin, the only requirement being that the laboratory is undertaking research.

It is desirable to have the information for the bulletin in hand as soon as possible so that the publication may appear within the current year.

• CORRECTION

In the advertisement of the Ciba Company, which appeared on page III of our March 21st issue, through an error of the copywriter, it was stated that CIBA BLUE 2B was a Di-Brom-Indigo. This is an error; it should have been Tetra-Brom-Indigo.

OBITUARY

GEORGE E. DRUM

GEORGE E. DRUM, aged 74, president of Smith, Drum & Co., Philadelphia, died March 17 in Germantown, Pa. In 1888, when 24 years old, he entered into partnership with Robert P. Smith and founded the business. Mr. Drum was identified with the engineering department while Mr. Smith took care of the outside contacts. When the firm incorporated in 1924, Mr. Drum became vice-president. He became president in 1929 following the death of Mr. Smith. Since 1933, Mr. Drum had not been active in the business because of poor health.

CLASSIFIED

POSITION WANTED: Finishing plant chemist desires responsible position. Expert on vats, napthols and other cotton and rayon dyeing. All types of control work and testing. 26 years' experience on yarn and piece goods. Write Box No. 993, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED—Salesman with ready contacts in the South, to represent a well known Dyestuff, Oil and Chemical Specialty house. Attractive proposition, on strictly commission basis. Write Box No. 114, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Plant-chemist, technician, desires position with progressive Finishing Plant. Experienced in processing of rayon, acetate, cotton piece-goods; can take complete charge of processing of Lastex Swimsuitings and Corset goods, can supervise laboratory control and research, economy in dyeing and finishing. References. Write Box No. 118, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.